THE

Practical Teacher

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'*Knowledge is proud that he has learned so much,*
Wisdom is humble that he knows no more.'—COWPER.

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Hygiene.

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Chairman of the Council of the Sanitary Institute.

SHELTER AND WARMING—(*continued*).

Heating by closed stoves is not likely to be popular in this country. The family circle prefers the open fireplace for rooms in which relatives assemble, and there is something companionable in an open fire when one is alone. It speaks to us in thought, if not in word, and assists us in that dreamy solitude in which not a few like to indulge when "building castles in the air." Nevertheless, for places of public assembly, such as churches and chapels, the halls of great houses, and for our public institutions, it is much more economical and satisfactory to use closed stoves, or hot water in iron pipes, than open fireplaces. All cooking should be done either by gas or the closed stove. There are a great number of patented designs for heating all places by all the usual methods. I must refer the reader for further information on these details to the Smoke Abatement Committee's Report, and to "Parkes Museum," in Margaret Street, London, where the reports may be consulted and models examined.

Healthy Temperature.—The temperate regions of the world give us a wide range; nevertheless our thermometers inform us that 55° F., and which is marked 'Temperate,' is the lowest comfortable point for old people and children. Able-bodied people will bear great extremes, but infants and the aged require artificial warmth when the outside temperature falls below 50°. Severe cold has a very depressing effect upon the extremes of life: and the death-roll mounts up at a tremendous rate when there is a long-continued frost. Those who are well fed, well clothed, and able-bodied, taking sufficient exercise, and leading generally healthy lives, do not feel the extremes of temperature in an injurious manner, but, on the contrary, are strengthened by them, but young children require to be kept at 60°, or thereabouts, and old people will bear a much greater degree of warmth with absolute comfort. The degree of temperature for the sick will vary somewhat with the character of their disease, as those suffering from lung mischief sometimes require a warmer atmosphere than others, though this is not an absolute rule, as some forms of lung disease do best in a colder and a dryer air, but as a rule a hospital ward should not fall below 60°, unless the outside air is very cold, in which case it may be considerably lower without mischief. Indeed, a steady and unvarying temperature is not a healthy one. The warmth of a room in which people live must be allowed to vary in accordance with outside changes, both as to heat and moisture. Convalescents from active diseases bear cold very badly. Warmth is absolutely necessary for them, even more than for those who are suffering from the immediate effects of acute diseases. The temperature ought not to fall below 55° until all effects of disease have departed, and then lower degrees of cold will help to strengthen.

Ventilation.—The air of a room may be polluted by a great many causes. The breath of the assembled audience or congregation; miasms from neglected *débris;* the products of combustion from gas-burners, and other means for lighting and warming; oxidizing agencies going on in the materials of which the place is built and furnished. These are the agents which supply the principal means for pollution. It is impossible to warm a place properly, and at the same time keep it healthy, if ventilation is neglected, and I must refer my readers to the articles upon ventilation in former numbers of THE PRACTICAL TEACHER for information upon this important point, and its bearing upon the warmth of rooms and buildings.

'CLOTHING AND MODES OF DRESSING.'

I now come to the question of shelter and warming as applying to the individual, and we have the most important agent for effecting warmth by our own actions.

Exercise.—Personal warmth cannot be kept up properly without it, and health is impossible if it be neglected. The natural temperature of the human body is about 98·5. It may vary about half a degree above or below that point. The agencies by which this temperature is maintained for the whole of the period during which man lives in the world is a great marvel. It is somewhat higher in the child, and decreases slightly in age. If it falls below 95° death is imminent; if it rises above 104° there is also imminent danger to life. The degree varies in

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different animals. In the horse and ass the normal temperature is about 101°, in the cow 102°, sheep 104°, the temperature varying with the age, being comparatively higher in the lamb and the calf, just as it is in the human child. The activity of the younger animal is in accord with this higher range. It is found that the heavy, listless, and lazy child has a lower temperature than a mercurial and restless little one. The temperature is indirectly dependent upon the character of the food. It is by means of the oxidation of the carbon of the food that warmth is maintained. This oxidation takes place in the periphery of the body. The food being manipulated in the mouth and stomach, is then mixed with certain ingredients which place it in a condition allowing it to combine with the oxygen in every part of the body in which function and nutrition are being carried on. One result of this action is the formation of carbon dioxide and the simultaneous development of heat which was latent in the carbonaceous matter and oxygen gas. The red arterial blood becomes darker venous blood, and the resulting CO_2 is hurried away to be removed from the body by the lungs, CO_2 being given up in the air-cells of that organ in exchange for oxygen. The atmosphere contains four parts of CO_2 in 10,000 under general circumstances. This is increased to about 4 per cent. in the expired air when respiration is not hurried. Exercise increases the elimination of CO_2 in a given time, as Dr. Edward Smith has shown. Taking the quantity of CO_2 eliminated as one in the recumbent position, it is nearly doubled by walking a mile within the hour. It is trebled by walking three miles, and if a rapid walk of four miles per hour is taken, the quantity of eliminated CO_2 is multiplied five times. This arises from the greater rapidity with which inspiration and expiration goes on. A man walking four miles an hour will inhale 2,400 cubic inches of air per minute, whilst a man sitting still and doing nothing will only inhale 480 cubic inches in the same time. This fact accounts for the reason why exercise warms the body and also produces a demand for carbonaceous food, carrying out the Divine law, 'If a man will not work, neither shall he eat.' Appetite follows upon work. It is in the muscles that the major portion of the CO_2 is formed in the body. Exercise warms the body by promoting the formation as well as the excretion of CO_2. This double property makes the great difference in effect between exercise and alcoholic drinks. They both bring blood to the surface of the body, but whilst the one increases chemical action all over the body and sets free latent heat, the other diminishes oxidation by preventing the formation of CO_2 at the very time when the body is losing heat more rapidly by radiation, and, as a consequence, a man under the influence of alcohol does not eliminate CO_2 to the same extent as a man who is sitting still in his chair, but who is not under the influence of alcohol. It is mainly for this reason that alcohol diminishes temperature, and renders a person under its action and accustomed to its use more susceptible to the influence of cold than is the total abstainer. Excessive exercise becomes injurious, by causing a greater flow of blood to arrive at the heart than can be passed through the lungs. In that case a man is said to be out of breath by exertion, and rest becomes absolutely necessary for his recovery. Deficient exercise causes a weak heart, and irregular exercise leads to disease of the heart, by making the weak heart become dilated in its cavities. These points are carefully thought of by the professional trainer when he understands his business. He will not allow his class to take any alcoholic liquor whilst in training. He will not allow them to train in an impure atmosphere, and he commences his work by slow degrees, gradually increasing speed as the circulation becomes accustomed to the exertion. It is found by experiment that continued exercise without food leads to a considerable fall, amounting to two degrees in the temperature of the body as soon as rest is obtained. The rise of temperature which follows upon increased exercise is kept down by the perspiration which is promoted by action. The insensible perspiration is so increased that its presence is manifested, it becomes sensible. Water, sodium, chloride, and some organic matters are found in the sweat. The rapidity of evaporation from the body may be diminished by cold air; but exercise, if severe enough, will produce sensible perspiration in any temperature, even in the Arctic regions. The character of the clothing under exertion must be carefully considered, a thin flannel is the best covering for reasons to be mentioned presently, whilst exertion is continued such as in the cricket-field and at lawn tennis, but whilst resting, an additional garment should be worn. It is sometimes said that a person should not go into the water whilst perspiring. It is better not to get heated before bathing, but it is far safer to plunge into the water at once rather than to wait until the body is cooled by exposure and radiation. The reaction is more satisfactory and decided on coming out of the water. The matter has been considered in the article on "Baths and Bathing."

Clothing and Modes of Dressing may be divided into two heads: first as to materials, and second, as to way in which they should be worn. These are intimately connected with hygiene, inasmuch as the nature of the materials used influences the health of the people in a marked way. Clothing is necessary for two reasons: First for protection against heat and cold, and second, for decency's sake.

As a protection against changes of temperature it is requisite to consider its capacity to retain heat, and keep out water. Its conducting properties as to the former, and its absorbent properties as to the latter, must be carefully looked at. Experience generally coincides with theory, and is a good guide in most directions. It is only when fashion and the usages of so-called 'society' come into play that folly and mischief go hand in hand together. Good conductors of heat make bad materials for clothing, but absorbents of moisture may be good or bad according to their conducting power.

1. *Materials* are derived from both kingdoms of nature. The *vegetable kingdom* gives us *cotton*, *linen*, *jute*, *cork*, and *caoutchouc*, or india-rubber, which is used to render clothing impervious to moisture. The *animal kingdom* provides us with *wool*, *silk*, *leather*, *skins*, *hair*, and *feathers*. We will shortly consider each in the order given above. *Cotton* is a cylindrical hair-like fibre, which is contained between the pod and the seed of the cotton-plant. It loses its cylindrical character as it becomes dry. Iodine stains it brown. A minute quantity of sulphuric acid with the iodine gives a violet-blue reaction. Nitric acid unrolls the twist which the fibre obtains when drying, but does not destroy its texture. Microscopically

the fibres are about $\frac{1}{3500}$ to $\frac{1}{4000}$ of an inch in diameter, and somewhat flattened. The chemical reaction of cotton and flax differ from those which belong to wool and silk. Wool and silk dissolve in solution of potass, whilst cotton and flax are not affected by it. They change into a kind of jelly in sulphuric acid, but wool is not affected by the test. Wool and silk take a yellow colour in strong nitric acid, whilst cotton and linen are unaffected by it. It is very easy to detect the sophistication which is practised by unscrupulous dealers. A mixed fabric of silk, wool, and cotton may be easily exposed. First boil the article in a strong solution of zinc chloride, and then wash—the silk is removed; then boil in a solution of caustic soda or potass, and the wool is dissolved; the cotton alone remains. If the specimen is well washed, dried, and weighed before and after each operation, the quantity of each material in the specimen may be determined with certainty.

Cotton fibre is very hard; it does not shrink by washing, it does not easily absorb water, and as a conductor of heat is placed between wool and linen. Calico consists entirely of cotton fibre. Merino contains less than half of wool. This bad conducting property of cotton accounts for the more comfortable feeling which belongs to calico sheeting; it does not strike so cold as linen in winter, because it conducts heat more slowly.

Linen (*Flax*, *Hemp*, and *Jute*).—The fibre of *flax* is easily recognised under the microscope; whilst the cotton fibre is flattened and riband-like, that of flax is finer, more cylindrical, and more irregular, presenting little knot-like swellings at regular intervals. The fibre of *hemp* is coarser than that of flax, and the swellings farther from each other. The fibre is also made up more distinctly of bundles, which separate from each other at the knots or joints. *Jute* is a cheaper and coarser fibre, longer and thicker—quite tubular with constrictions. The fibres are somewhat adherent from the presence of a resinous matter, which makes it still less absorbent than either cotton or linen.

Cotton fibre is the product of various species of Gossypium, belonging to the order *Malvaceæ*. It flourishes best in sub-tropical regions.

Flax is fibre contained in the stalk of the *Linum usitalipumium*, belonging to the natural order *Caryophyllacæ*: is grown best in Ireland.

Hemp is obtained from the stalks of the *Canalis sativa*, one of the nettle tribe, found all over the world.

Jute is the fibre from a plant called *Corchurus capsularis*, belonging to the order *Tiliaceæ*, which flourishes in Central Asia and India, and some parts of Russia.

As articles of clothing, cotton is warmer because it is the worst conductor of heat. Linen is more absorbent than cotton, and feels colder. Jute is frequently used for the cheapening of fabrics; it is less serviceable and coarser than either linen or cotton, and may be easily recognised by the microscope, in consequence of the tubular character of its fibre. Cotton and linen are often dressed with starch to give them weight and glossiness. This adulteration is detected by iodine, which strikes a blue colour. A specimen which has been well washed will not give this reaction, and the material will be easily seen to have become thinner and more porous by the process.

Wool consists of round fibres, which are colourless until they have been stained by dyeing. A canal may have existed in its interior, but it has become obliterated as the fibre perfects. It is made up of a number of cells which produce irregular markings upon the fibre, as if notched. These notches disappear by wear. They are more distinct in new garments than in old. The fibre has a medium of about $\frac{1}{1000}$ of an inch in diameter, but the finer and the best kinds have the smallest diameter. Blankets, flannels, and broadcloth are the principle articles of clothing which are made of wool. The great advantage of wool as an article of clothing is its bad conducting power, and it absorbs water so that the fibres enlarge without becoming wet to the touch, at the same time that the condensation of the moisture or insensible perspiration from the body gives a feeling of warmth from the latent heat which is set free by the process. The act of perspiration is attended with loss of heat. A woollen garment controls this loss, and hence it is a much more comfortable garment than either cotton or linen, which become wet to the feelings by the act of perspiration; and as they become dry they assist to carry off heat by the evaporation which is necessary for the process. Cotton and linen are also more porous than wool, and allow the passage of water through the texture more easily than wool does. This porosity is an important property. The rapidity with which air passes through articles of clothing has been noted by Pettenkofer as to some extent modifying the usefulness of a particular article. The most porous is not, however, the coldest, for flannel is much more porous than either linen or silk.

(*To be continued.*)

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How to Teach Drawing in Elementary Schools.

BY T. R. ABLETT,
Superintendent of Drawing to the School Board for London.

DRAWING FROM MODELS.

IT is unnecessary for me to dwell long upon the importance of model drawing. In its practice the pupil first tastes the delight of being in possession of a power of description which is, in many cases, far beyond that which words can supply. Drawing has been said to be a universal language, for by its means a clever artist can set down wonderful effects and delightful combinations of form in such a way as will rouse the emotions which he feels in the breasts of those who cannot understand his words, but who see his pictures.

To turn from possibilities to actualities, we find that model drawing has not been a favourite subject in many elementary schools. Teachers, as a rule, have discovered that they cannot get so good a result in the examination in this subject as in freehand and model, though they devote the same time and energy to all. To get at the reason for this, I have given the matter most careful consideration for some years.

I find that most elementary teachers have too slight an acquaintance with vital principles, because they themselves have not been taught by the best methods. Besides this there are serious practical difficulties to contend with in teaching model drawing in an ordinary class-room. Model drawing may no longer be taken or left alone at the discretion of the

teacher. All those who intend to take drawing as a class-subject must be ready to deal with this branch of it in the best possible manner.

1. *Position of the Models.*

Because the groups set in the examination have hitherto been placed below the level of the eye, the large majority of teachers never show the method of dealing with an object placed above it. It should hardly be necessary to point out that models placed low down cannot be properly seen by more than half the members of a medium-sized class, and also that in the majority of objects around us many lines are above the level of the eye. Those who never teach drawing from objects above the level of the eye, or which have some of their lines above it, ignore many important principles. For the efficient instruction of a large class in ordinary class-rooms, the models need to be generally placed on or above the level of the eye.

If the model or object is placed directly in front of the class, it will be necessary for the teacher to give three separate demonstrations—one to the children on the left-hand side, one to those on the right-hand side, and one to those in the centre. It would be found, I think, that it is no rare occurrence for a teacher thus to treble his or her labour. One demonstration only is needed if the model be placed in the extreme left or right of the space in front of the class.

2. *The simple conditions to be observed in making a drawing.*

(*a.*) Objects with dimensions in a number of different planes must have all their lines represented on one plane. This plane, in the eye, is the retina, but in drawing it is an imaginary plane—named the picture plane—placed between the eye and the object. As the lines would appear on the picture plane so they must be put on the sheet of drawing-paper which represents it. Great economy of time is effected if a sheet of glass be placed in the position of the picture plane, and a tracing of the object be made on it.

(*b.*) The head must remain in one position. Any movement gives a different view, and one view only is represented in a drawing.

(*c.*) One eye only is to be used, as each eye gives a different view. To prove this, tell the children to look at the right hand at first with the right eye, and then with the left. The right hand should be held about a foot in front of the right eye, so that only the first finger is visible when the hand is open and vertical. The left hand, which meanwhile has been covering the left eye, should be removed to the right eye, and the left eye will see not the first finger *only*, but one side of the other fingers as well.

(*d.*) The eye must look in a direction parallel to the surface of a horizontal plane. If the actual height of the eye above the floor, or ground, is marked as CV on the model or object, half-way between the extreme point on its left-hand side and right-hand side, and the eye looks at CV, its direction will be correct. Should the object be quite above or quite below the level of the eye, the aforesaid point CV may be marked on a vertical rod in front of it.

(*e.*) The position of the picture plane (represented by the glass plane) must be vertical, and at right-angles to the line between the eye and CV. This may be stated in another way, by saying that the picture plane must be so placed that the line between the eye and CV will be perpendicular to it.

It is very necessary that a teacher should be thoroughly acquainted with these simple conditions.

The true position of the picture plane is not at all clearly understood. Some persist in thinking that it ought to be parallel to the desks in a class-room. This idea seems to have been handed down as a tradition, because, in the early examinations, scholars were required to make a drawing with one side of the object parallel to the picture plane.

The position of the picture plane entirely depends upon the position of the eye, and that is fixed in a way best suited to the object, or objects, to be drawn.

This matter is illustrated in the following figures :—

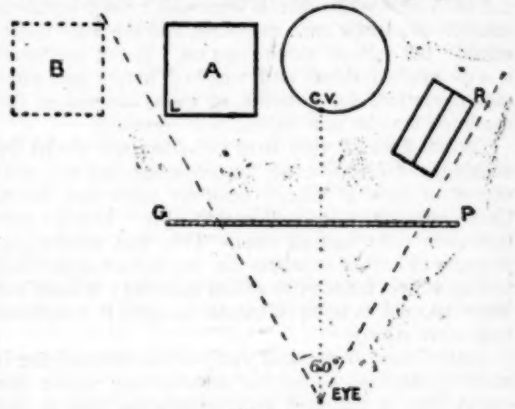

Fig. 1.

Fig. 1 shows the plans of two cubes, a cylinder and a prism. CV is marked on the cylinder to show the height of the eye from the ground. The eye looks at CV, because the cube, cylinder, and prism are to be drawn, and CV is half-way between L and R, the extreme points of the group. The glass plane (picture plane) is placed at right-angles to the line between the eye and CV. The cube with the dotted plan (B) cannot be included in the drawing, because it is outside the range of vision. The range of vision is formed by a cone of rays with an angle of 60° at its apex, and the line from the eye to CV for its axis. CV is, therefore, the centre of vision.

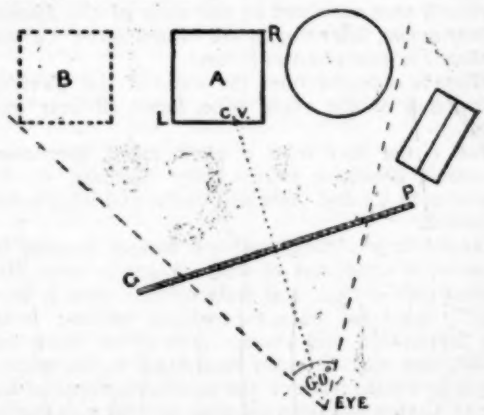

Fig. 2.

In Fig. 2 the cube A is to be drawn alone. The eye, which remains in the same position, is, however, revolved in part to look at CV (now placed near the middle of the cube A), and the glass plane must also be

moved. A drawing of cube B and the cylinder might be included with that of A, but the prism could not be drawn, as it falls without the range of vision marked by the disconnected lines.

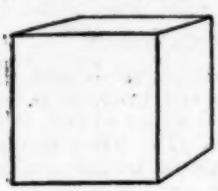

Fig. 3.

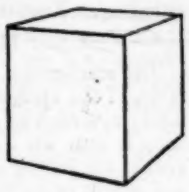

Fig. 4.

Fig. 3 represents the cube A as it would be drawn in Fig. 1, where one of its sides is parallel to the glass plane.

Fig. 4 represents the cube A as it would be drawn in Fig. 2, where none of its sides are parallel to the glass plane.

Thus it will be seen that, from the same point of view, an object may be drawn either in parallel perspective or angular perspective, according to the direction in which the eye looks. The direction in Fig. 1 was fixed to suit the whole group, and in Fig. 2 to suit cube A specially.

If a class of children are taught that the picture plane is parallel to the front desk, many will have to draw the object when it is far outside their range of vision, for they must look in a direction at right-angles to the plane and not at the object. When acting as Examiner for the Science and Art Department, a batch of model drawings sometimes came under my notice, so much alike that it was difficult to say whether they were drawn from an object, or were a reproduction from memory of one of the drawings made on the blackboard by the teacher at some lesson. The head-master of a school once told me that out of 200 candidates which he sent in, only one passed. Some radical mistake in teaching was, no doubt, the cause.

In giving a course of lessons, we should begin with the largest available objects, so that the apparent difference in the length of equal lines, placed at unequal distances from the eye, may be readily detected, by measuring with the pencil or a long rod provided for the purpose. Cubes, cylinders, prisms, and the like are not suitable for first instruction—partly on account of their small size, and partly because they are objects not familiar or particularly interesting. Our present system of teaching this subject is calculated to lead to the belief that it is a mysterious process, only to be employed in representing odd-shaped figures made specially for the purpose. We should seek to make drawing a real power, by encouraging its employment, from the first, in delineating the objects of every-day experience.

3. *First Lesson.*

Our first lesson should be from objects of two dimensions, placed vertically at the right or left hand of the class, and may be of such a kind as this:—From a position near the middle of the class, trace upon the glass plane, with yellow blackboard chalk, ordinary white chalk, soap, or Chinese white, a map-sheet, hung rather high on that part of the side wall in front of the class. Allow the pupils to file round and see that the lines of the tracing coincide with the outlines of the object. When the pupils have returned to their places, point out the differences that exist between the tracing and the map-sheet itself. Show, by measuring, that the lines which represent equal lines are unequal, and that the lines which represent parallel lines appear, when produced, to converge to one point. Mark a point on the glass immediately opposite to the position which the eye occupied when the tracing was made, and draw a horizontal line through this point to show the level of the eye. Call attention to the fact that the lines representing the parallel lines meet in a point on the line which shows the level of the eye. Having put the glass plane on one side, measure the average height of the pupils' eyes above the floor, and mark that height (point CV) on the wall below the map. (Where pupils have seats on platforms of different height, it will be necessary to mark a point showing the level of the eye for each platform, CV 1, CV 2, CV 3, etc.) Direct all members of the class to draw a line across their paper, one inch from its top, to represent the level of the eye, as in Fig. 5, where the dotted lines show the edges of the sheet of paper. Point out that the map is above the level of the eye, and direct the pupils to draw a line (AB) to represent

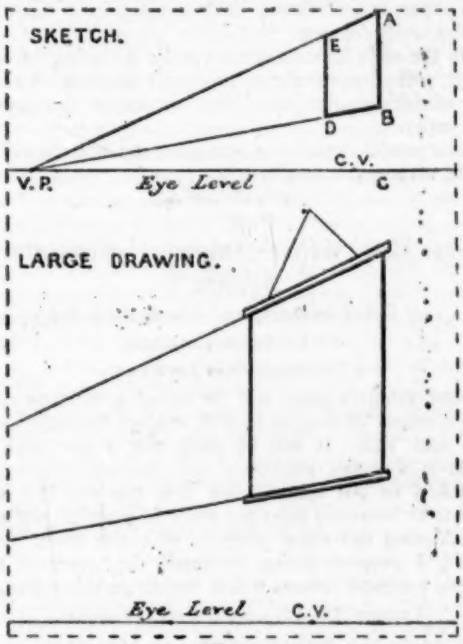

Fig. 5.

the nearest vertical edge of the map, beginning at the top edge of the paper, and descending only so far as will make correct the proportion between the length of the map's edge and the distance (BC) of the bottom of it above the level of the eye. Direct all to hold the pencil or rod at arm's length, on imaginary glass planes, in a horizontal position, so that the nearest point (B) of the lower edge of the map will appear just below the pencil. Before using the pencil in this way, ask the pupils to hold up their books or sheets of drawing paper in the position that the glass plane would occupy. When each one has this right, inform the class that every member could get a correct drawing, by tracing, if the sheets of paper were really sheets of glass.

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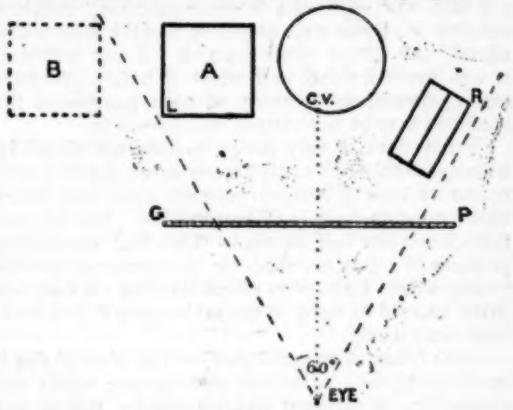

Fig. 1.

Fig. 1 shows the plans of two cubes, a cylinder and a prism. CV is marked on the cylinder to show the height of the eye from the ground. The eye looks at CV, because the cube, cylinder, and prism are to be drawn, and CV is half-way between L and R, the extreme points of the group. The glass plane (picture plane) is placed at right-angles to the line between the eye and CV. The cube with the dotted plan (B) cannot be included in the drawing, because it is outside the range of vision. The range of vision is formed by a cone of rays with an angle of 60° at its apex, and the line from the eye to CV for its axis. CV is, therefore, the centre of vision.

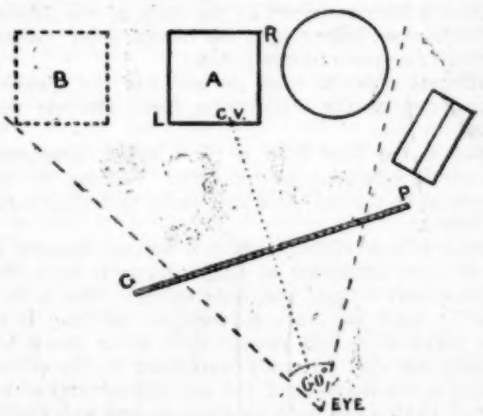

Fig. 2.

In Fig. 2 the cube A is to be drawn alone. The eye, which remains in the same position, is, however, revolved in part to look at CV (now placed near the middle of the cube A), and the glass plane must also be

moved. A drawing of cube B and the cylinder might be included with that of A, but the prism could not be drawn, as it falls without the range of vision marked by the disconnected lines.

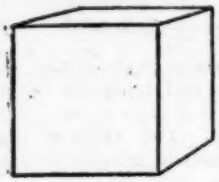

Fig. 3.

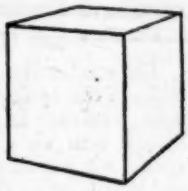

Fig. 4.

Fig. 3 represents the cube A as it would be drawn in Fig. 1, where one of its sides is parallel to the glass plane.

Fig. 4 represents the cube A as it would be drawn in Fig. 2, where none of its sides are parallel to the glass plane.

Thus it will be seen that, from the same point of view, an object may be drawn either in parallel perspective or angular perspective, according to the direction in which the eye looks. The direction in Fig. 1 was fixed to suit the whole group, and in Fig. 2 to suit cube A specially.

If a class of children are taught that the picture plane is parallel to the front desk, many will have to draw the object when it is far outside their range of vision, for they must look in a direction at right-angles to the plane and not at the object. When acting as Examiner for the Science and Art Department, a batch of model drawings sometimes came under my notice, so much alike that it was difficult to say whether they were drawn from an object, or were a reproduction from memory of one of the drawings made on the blackboard by the teacher at some lesson. The head-master of a school once told me that out of 200 candidates which he sent in, only one passed. Some radical mistake in teaching was, no doubt, the cause.

In giving a course of lessons, we should begin with the largest available objects, so that the apparent difference in the length of equal lines, placed at unequal distances from the eye, may be readily detected, by measuring with the pencil or a long rod provided for the purpose. Cubes, cylinders, prisms, and the like are not suitable for first instruction—partly on account of their small size, and partly because they are objects not familiar or particularly interesting. Our present system of teaching this subject is calculated to lead to the belief that it is a mysterious process, only to be employed in representing odd-shaped figures made specially for the purpose. We should seek to make drawing a real power, by encouraging its employment, from the first, in delineating the objects of every-day experience.

3. *First Lesson.*

Our first lesson should be from objects of two dimensions, placed vertically at the right or left hand of the class, and may be of such a kind as this:—From a position near the middle of the class, trace upon the glass plane, with yellow blackboard chalk, ordinary white chalk, soap, or Chinese white, a map-sheet, hung rather high on that part of the side wall in front of the class. Allow the pupils to file round and see that the lines of the tracing coincide with the outlines of the object. When the pupils have returned to their places, point out the differences that exist between the tracing and the map-sheet itself. Show, by measuring, that the lines which represent equal lines are unequal, and that the lines which represent parallel lines appear, when produced, to converge to one point. Mark a point on the glass immediately opposite to the position which the eye occupied when the tracing was made, and draw a horizontal line through this point to show the level of the eye. Call attention to the fact that the lines representing the parallel lines meet in a point on the line which shows the level of the eye. Having put the glass plane on one side, measure the average height of the pupils' eyes above the floor, and mark that height (point CV) on the wall below the map. (Where pupils have seats on platforms of different height, it will be necessary to mark a point showing the level of the eye for each platform, CV 1, CV 2, CV 3, etc.) Direct all members of the class to draw a line across their paper, one inch from its top, to represent the level of the eye, as in Fig. 5, where the dotted lines show the edges of the sheet of paper. Point out that the map is above the level of the eye, and direct the pupils to draw a line (AB) to represent

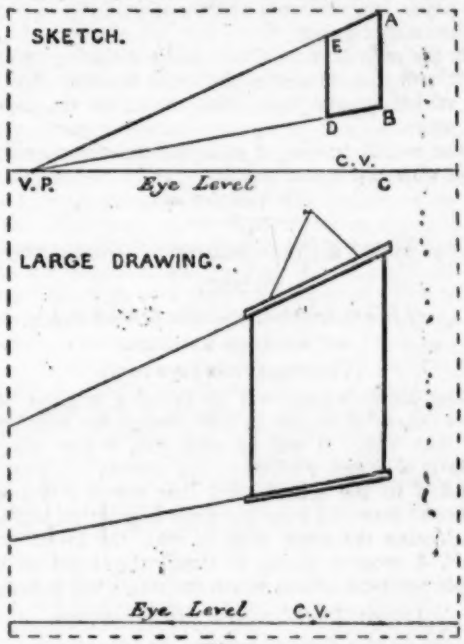

Fig. 5.

the nearest vertical edge of the map, beginning at the top edge of the paper, and descending only so far as will make correct the proportion between the length of the map's edge and the distance (BC) of the bottom of it above the level of the eye. Direct all to hold the pencil or rod at arm's length, on imaginary glass planes, in a horizontal position, so that the nearest point (B) of the lower edge of the map will appear just below the pencil. Before using the pencil in this way, ask the pupils to hold up their books or sheets of drawing paper in the position that the glass plane would occupy. When each one has this right, inform the class that every member could get a correct drawing, by tracing, if the sheets of paper were really sheets of glass.

As each has not a glass plane, the pencil is used to find out how the lines would come on the glass plane. Just as they would be traced on it so they must be put on the drawing paper. The lowest edge of the map (BD), though actually horizontal, will appear to slope downwards, and must be so drawn until it meets the line first drawn to show the level of the eye in VP. On the imaginary glass planes, direct the pupils to hold their pencils vertically, and to measure the apparent length of the nearer vertical edge (AB) of the map, and compare it with the further one (ED). The further edge, though actually of the same length, appears shorter, and must be drawn so, starting from the line BD, which represents the lower edge of the map. Let the direction of the lower edge (BD) of the map be compared with the upper (AE), and the latter is found to appear to have a greater slope. Show, by referring to the tracing on the glass, that these lines appear to meet on the line drawn level with the eye. Draw EA to VP. Ascertain, by measuring, whether the apparent width of the map has been made in right proportion to the height. Now that a small drawing is completed, direct the pupils to make a very much larger drawing, showing detail, on the lower part of the paper, in accordance with the discoveries recorded in the small drawing.

In the early lessons, always make a tracing on the glass, and always insist on the small drawing showing the vanishing point being first drawn on the top of the paper.

The model drawing of straight-lined objects will be dealt with in the next article.

(*To be continued.*)

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The New Class-Subject, 'Elementary Science.'

(What to teach, and how to teach it.)

BY RICHARD BALCHIN.

(*Continued from page* 149.)

IN last month's issue will be found a syllabus of a year's course of lessons in this subject for Standards VI. and VII. It will be seen that I now assume there is a school workshop and chemical laboratory attached to the school, and that the scholars will devote at least one hour per week to practical work.

Adopting the same plan as with the lower standards, I propose giving in detail the notes of the simple practical lessons which constitute this scheme.

LESSON I.—WEIGHTS AND MEASURES.

Meaning of a decimal system; its advantages.

For length: The *metre;* a little over a yard; 39·37 inches: its decimal multiples, using Greek prefixes, thus:—ten metres, a *deca*-metre; a hundred metres, a *hecto*-metre; a thousand metres, a *kilo*-metre. Its decimal divisions, using prefixes of Latin origin, thus:—a *deci*-metre (dm.) is the tenth part of a metre; a *centi*-metre (cm.) is the hundredth part; and the *milli*-metre (mm.) the thousandth part.

For capacity: A cubic decimetre is termed a *litre*, and is about $1\frac{3}{4}$ pints (1·76 pints, or 61·03 cubic inches). The litre is divided and multiplied similarly to the metre.

For weight: A cubic centimetre (ccm.) of pure water, at a temperature of 4°C., is taken as a unit of weight, and is called a *gram*. This, also, is divided and multiplied similarly to the metre. The most commonly used multiple is the kilogram (kilo), which contains 1,000 grams, and is equal to about $2\frac{1}{4}$ lbs. A cubic metre of water (about an ordinary English water-cart full) contains 1,000 kilos, and is very nearly equal to an English ton.

LESSON II.—THE METRIC SYSTEM.

The teacher should make a large wall-diagram, or table, of the system of weights and measures to be used; and each boy should make a copy on card, and hang it near his working-bench. The whole of the system will not be wanted. I should tabulate length and weight only; thus:—

METRIC DECIMAL SYSTEM OF MEASURES OF LENGTH AND WEIGHT.

Length.	*Weight.*
Millimetre, $\frac{1}{1000}$ of a metre.	Milligram, $\frac{1}{1000}$ of a gram.
Centimetre, $\frac{1}{100}$ of a M.	Centigram, $\frac{1}{100}$ of a G.
Decimetre, $\frac{1}{10}$ of a M.	Decigram, $\frac{1}{10}$ of a G.
METRE (little over 1 yard).	GRAM (cubic centimetre of water).
Decametre, 10 metres.	Decagram, 10 grams.
Hectometre, 100 metres.	Hectogram, 100 grams.
Kilometre, 1,000 metres, (=little over $\frac{1}{2}$ a mile).	Kilogram, 1,000 grams. (1,000 kilos=1 Eng. ton, nearly.)

LESSON III.—THE GRAM.

The laboratory is, of course, supplied with scales and weights. Let the boys weigh out about ten different objects, such as sticks of chalk, fragments of white marble, charcoal, etc., inkwells, with and without ink. Record the results, in grams, in their exercise-books after the metric table.

LESSON IV.—THE CENTIGRADE THERMOMETER.

Have before the boys Fahrenheit and Centigrade thermometers. Explain the two gradings, and the advantage of the latter. In the former the freezing point of water is 32°, and the boiling point 212°. In the latter these points are 0° and 100°, respectively; hence the term *centi*-grade. For changing the record of a Fahrenheit to that of a Centigrade, use the following formula:— $\frac{5}{9}(F^\circ - 32) = C^\circ$.

Thus:— $\frac{5}{9}(212^\circ - 32) = 100^\circ$.

Have about a dozen glasses; some snow, or ice, and salt, and some warm water. Take a number of temperatures, and compare them. Let the boys do the same, first with one thermometer, then with the other; in each case verifying the result according to the above formula, and recording the experiments in their exercise-books.

LESSON V.—LAWS OF CHEMICAL COMBINATION.

These laws and their corollary, 'the atomic theory,' seem to be so imperfectly grasped by our younger teachers, and so incorrectly presented to the scholars, that it would, perhaps, be well for me to give somewhat in detail the successive points in my lessons by which I have generally succeeded in conveying to the boys accurate, though elementary, ideas upon the subject.

When elements combine to form compounds, it is found by experiment that there is a great regularity in the method of combination. We do not find, for instance, that *any* amount of carbon will combine with *any* amount of oxygen; nor *any* amount of oxygen with any amount of phosphorus. It *is* possible to combine 16 milligrams, or grains, of oxygen with 12 such weights of carbon; but we never find 14, say, of the latter with 16 of the former; nor 10 of the former with 12 of the latter. If we wish to combine sodium with any other element, we must

not take less than 23 parts by weight of it; we cannot combine, say, 20 grains of sodium with a certain number of grains of any other element. It is the same with all the elements. If we analyse common salt, we find it composed of 35½ parts by weight of chlorine to 23 parts of sodium. And this is true of salt, from whatever source it may be obtained; whether we get it from the sea, or from brine springs, or from salt mines, it always contains the elements chlorine and sodium in the proportion of 35½ of the former to 23 of the latter. Also, whether carbon dioxide be formed by the combustion of a candle in air, or by burning charcoal in oxygen, or by animal respiration, the compound is invariably made up of 32 parts by weight of oxygen and 12 of carbon. Similarly, whether phosphorus be burned in air or in pure oxygen, we get an oxide of phosphorus composed of 80 parts by weight of oxygen to 62 of phosphorus.

The boys will, perhaps, have observed in some of these numbers another point of regularity. The *least* number of grains of, say, oxygen which will combine with any other element is 16. But if a *greater* weight of oxygen combines with other elements, the increase is always by so many times 16; in other words, multiples of 16. We do not find, for instance, that 20 grains of oxygen combine with a certain number of grains of iron; but only 32, or 48, or some other multiple of 16. And it is the same with iron, whose combining amount with grains of the other elements must be either 56 or some multiple of 56. There is an oxide of iron called the 'black oxide,' which consists of '4 times 16' parts by weight of oxygen with '3 times 56' parts of iron. There is another iron oxide where '3 times 16' parts by weight of oxygen combine with 'twice 56' parts of iron. Now, in all these facts—and they *are* facts, for they have all been demonstrated by actual experiment—we detect the existence of certain laws, called 'Laws of Chemical Combination,' the first of which may be thus stated:

'The same body is always composed of the same elements united in the same proportion.'

The boys should write out this law, and, from the instances given in the lesson, should select those which prove the truth of it.

LESSON VI.—LAWS OF CHEMICAL COMBINATION.

We have seen that oxygen combines with other elements always in weight-parts of 16, or some multiple of 16; that iron combines in weights of 56, or some multiple; carbon in 12; chlorine, 35·5; and so on with all the other elementary bodies. Actual experiment has proved the truth of this. Hence we may state, as the second law of chemical combination, that

'When an element unites with another in different proportions, the higher proportions are invariably multiples of the lowest.'

The boys should write out this law and the following illustrations of it: Carbon monoxide, which contains 16 parts by weight of oxygen; carbon dioxide, which contains 2 × 16, or 32; carbon bisulphide, which contains 2 × 32, or 64 of sulphur; sulphur dioxide, which contains 2 × 16, or 32, parts of oxygen; phosphorus pentoxide, which contains 5 × 16, or 80, parts of oxygen; the black, or magnetic, oxide of iron, which contains 3 × 56, or 168, parts of iron, combined with 4 × 16, or 64, parts of oxygen.

From what has now been stated, the boys will see that there is assigned to every element a certain number which, so far as we can at present gather, represents the combining proportion by weight of that element. Do not, however, give the number a name just now.

LESSON VII.—LAWS OF CHEMICAL COMBINATION.

The third law of chemical combination, viz., that of 'reciprocal proportion,' I find to be beyond the grasp of boys in our schools; unless, indeed, the class is quite above the average in intelligence. I therefore omit it, and pass on to consider the combining proportions of compound bodies.

The boys have already learned that there is a carbonate of lime and a *bi*carbonate, a carbonate of soda and a *bi*carbonate, and so on. Mix up some chalk and water. The water is at first milky; but soon the whole of the chalk settles, leaving the water clear, as at first. Chalk is carbonate of lime, consisting of one part of carbon dioxide with one part of lime. Carbonate of lime is, therefore, insoluble in water. But in chalk districts, such as parts of Surrey, the drinking water, as it springs from the ground, is charged with a quantity of a carbonate of lime, and is yet quite clear and sparkling; the fact being that in these springs we have another form of the carbonate—viz., the *bi*carbonate, consisting of *two* parts by weight of carbon dioxide to one of lime; and this is soluble in water. Wherever such combinations take place, 'the combining proportion by weight of the compound is either the sum, or a multiple of the sum, of the combining proportions of the several elements.' Hydrogen being 1, and oxygen 16, the number representing the combining proportion of water, H_2O, is $2+16$, or 18; that of carbon dioxide, CO_2, is $12+2\times16$, or 44. Hence the higher proportions in which these compounds combine are multiples of 18 and 44.

In our lessons so far, the boys will have seen that to every element there is a number assigned which represents what we have called its combining proportion by weight. The boys should learn by memory at least twelve of these. In a previous article I promised to explain a system of 'mnemonics' by which these and similar sets of numbers may be fixed upon the memory. I do not use this 'phrenotypics' myself, but possibly the method may be useful to others. The cipher (0) and the nine digits are represented by certain consonants, as in the following table. The vowels have no numerical representative.

	0. *s*, *z*. *c* (soft).	
1. *t*. *d*.	2. *n*.	3. *m*.
4. *r*.	5. *l*.	6. *h*. *sh*. *ch* (soft). *tch*. *j*.
7. *k*. *c* (hard). *g* ,, *ch* ,, *q*. *x*.	8. *f*. *v*. *ph*. *w*.	9. *p*. *b*.

By the aid of this table, and using vowels, we turn any number we wish to remember into a word, and then associate the idea expressed by the word with the fact in connection with which we wish to remember the number. Thus: I have to remember the number 56, in connection with the element iron. From the table I find that 5 is *l*, and 6 is *tch*. Using a vowel, we form the word *latch*. The act of mental association at once follows, for we think of an iron latch. In like manner, the number 12 is to be associated with carbon. The word *done* gives 12, and we at once think of meat or bread overdone, *i.e.*, turned to carbon. When a boy, I was taught to remember dates of events by this system.

The following are twelve elements whose combining proportions the boys should commit to memory. The word after the number is the phrenotype; the number-letters are in italics.

Calcium	40 *rise*	Carbon.....	12 *done*
Iron	56 *latch*	Oxygen	16 *dash*
Mercury	200 *noses*	Chlorine	35·5 *smell*
Nitrogen	14 *tear*	Potassium ...	39·1 *my pot*
Phosphorus...	31 *mad*	Sulphur	32 *mine*
Copper.....	63 *sham*	Zinc	65·2 *hole in*

(To be continued.)

—o—

Chemistry of the Non-Metallics.

BY EDWARD AVELING, D.SC. LONDON.

[This series of articles, whilst dealing with the subjects required by the University of London for the Matriculation Examination and with those required at the Elementary Stage of the Inorganic Chemistry (Branch X.) Science and Art Department, is intended as a practical guide to the philosophical and systematic study of the non-metallics.]

CHAPTER IX.

MIXTURE. AIR. COMPOUNDS. OXIDES.

E. MIXTURE.—The air is a mixture containing oxygen, and will be studied next.

1. *Composition.*—The symbols of a mixture cannot be given. As air is a mixture, it does not follow the law of constant proportions given on page 495, vol. iv. Approximately in 100 parts of air by volume there are:—

(1) Nitrogen 79
(2) Oxygen 21.

In 100 parts by weight—

(1) Nitrogen 77
(2) Oxygen 23.

Only a small quantity of carbon dioxide is present, although the breathing of both plants and animals is constantly adding the gas to the air. Its small quantity is due to the fact that plants feed on carbon dioxide. There is a perceptible quantity of steam, with traces of ammonia, ozone, and nitric acid.

100 parts by volume of air contain:—

Nitrogen	77·906
Oxygen	20·6594
Steam	1·4
Carbon dioxide	·0336
Ammonia...	·0008
Ozone	·00015
Nitric acid	·00005
	100·00000.

2. Experiments to prove the presence in the atmosphere of the chief gases.

Nitrogen and oxygen can be demonstrated by one experiment.

Take a pneumatic trough and bee-hive. Partly fill the trough with water. Float on the water over the bee-hive a watch-glass. Cut off *under water* a piece of phosphorus. Dry it, place it on the watch-glass. Set the phosphorus on fire. Place over it, as it burns, an inverted bell-jar. (Fig. 25.) Fumes like those found

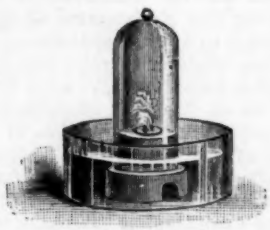

Fig. 25.

when phosphorus was burnt in oxygen appear, and are, after a time, absorbed. (See page 155.) This proves the presence of oxygen in the air. After the fumes have disappeared, the gas left will be found to be nitrogen. For the properties of nitrogen, see later on. If a piece of phosphorus, carefully weighed, is burnt in a closed vessel, *not* over water, and none of the resulting gas is allowed to escape, the contents of the vessel weighed after the experiment will weigh more than the phosphorus weighed originally. If, however, the phosphorus and the vessel with its air contents are weighed, and then, after the burning of the phosphorus the vessel and its contents are again weighed, the latter weight will be found equal to the sum of the two former. There has been change of state, but no destruction of matter.

Another method is to pass up into a graduated tube (Fig. 26), a wire, on the end of which a piece of phos-

Fig. 26.

phorus melted under water has been allowed to cool After some hours the water will have risen to about one-fifth of the height of the graduated tube, as the phosphorus has slowly combined with the oxygen of the air in the tube.

Or, suspend by a magnet iron filings from the scale of a balance. Weigh the magnet and filings. Heat the latter, and the weight will be found to have increased as the iron has united with some of the oxygen of the air.

The presence of steam is shown by the exposure of a deliquescent salt like calcium chloride, or like common rock-salt, to the air. The salt takes up moisture from the air, and becomes moist.

The presence of carbon dioxide is shown by exposing a saucerful of lime-water to the air. A crust of chalk or calcium carbonate forms on the surface.

$$\underset{56}{Ca\,O} + \underset{44}{CO^2} = \underset{100}{Ca\,CO_3}$$
2 vols.

3. *Properties.*—(i.) A mixture of gases, none of which, save steam, is easily liquefiable.

(ii.) Without taste, odour, colour. Transparent.

(iii.) 14·47 or 1. The weight of air is shown by filling a flask with air, weighing the flask with its contained air in a vacuum, and comparing the weight with that of the flask exhausted of air.

(iv.) As it is a mixture, it is not dissolved as air by water. Each of its constituent gases is taken up by the water according to the amount of solubility of that gas. Oxygen is nearly twice as soluble in water as nitrogen. Consequently the air dissolved in water has a different composition from ordinary air. To demonstrate this fact, place in a flask water that has been exposed to air for some time, and fit the flask with a cork, and a delivery tube that leads to a graduated tube, containing a solution of caustic soda. (Fig. 27.) Boil the water in the flask for

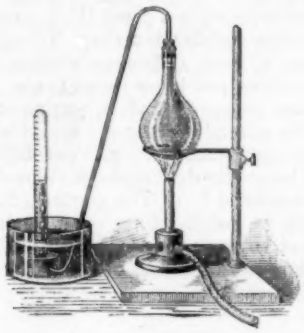

Fig. 27.

ten minutes. The contained gases, nitrogen, oxygen, carbon dioxide, come off from the water more rapidly than the steam. The nitrogen and oxygen pass on, displacing the solution of soda, whilst the carbon dioxide is absorbed by the soda, and the steam condenses. Hence there is left over the soda solution in the graduated tube a mixture of nitrogen and oxygen in the same proportion as that in which they were dissolved in water.

Transfer the tube to a pneumatic trough, partly filled with water, and let it stand until all is cool and the heavy solution of soda has fallen out and been replaced by water. Introduce a piece of phosphorus, as before directed, and the water is found to rise one-third of the length of the tube, not one-fifth.

The actual numbers are, according to Professor Thorpe :

1. Nitrogen (before solution) 20·96. (after solution) 35·91.
2. Oxygen „ „ 79·04. „ „ 65·09.

(v.) *Supporter of combustion.*—Not so active in this respect as pure oxygen. The negative properties of nitrogen serve to lessen the violence of the action that would take place if pure oxygen were the gas concerned in combustion and in respiration.

(vi.) *Specialties.*—Diathermanous. δια (dia)=through ; θερμος (thermos)=heat. Air does not absorb the heat that comes from the sun to any appreciable extent. The temperature of the air is, however, raised by the heat that is due to radiation from the surface of the earth. The uses of each of the gases in the air are, as far as is known, as follows :

Oxygen. Supporter of combustion and respiration.
Nitrogen. Diluter of the oxygen.
Steam. Gives elasticity to bodies ; food of plants, etc.
Carbon dioxide. Food of plants.
Ammonia. Food of plants.

QUESTIONS ON AIR *(solved).*

77. Assuming that the proportions of oxygen and nitrogen by volume in air are 21 and 79 respectively, determine the specific gravity of air.

21 vols. of O weigh (16×21) grams= 336 } 100 parts of air
79 „ N „ (14×79) „ =1106 } weigh 1442 grms
100 „ H „ (1×100) „ = 100 H „ 100 „

Specific gravity of air 14·42.

78. If air contains 4 parts of carbon dioxide in 10,000, find the volume of air necessary to form chalk with 8 grams of lime.

56 grams CaO need 22·4 litres CO^2
1 gram „ needs $\frac{22·4}{56}$ „ „
8 grams „ need $\frac{22·4\times 8}{56}$ „ „
4 parts of CO^2 occur in 10,000 air,
1 part „ occurs in $\frac{10,000}{4}$ „
$\frac{22·4\times 8}{56}$ „ occur in $\frac{10,000\times 22·4\times 8}{4\times 56}$ air
=8000 litres.

QUESTIONS ON AIR *(for solution).*

70. Find the weight of a litre of air .....$1\frac{327}{1000}$ grams.

71. What volume of oxygen is present in 200 cubic kilometres of air? .....42,000,000,000,000 litres.

72. If air contains $1\frac{1}{2}$ per cent. of steam, what volume of air must be taken to yield 180 grams steam?.....$14,933\frac{1}{3}$ litres.

COMPOUNDS.—Oxygen is the most general element in compounds. Every other element has been found in union with it except fluorine. Eight-ninths, by weight, of all the ice, water, and steam (H^2O) in the world are oxygen ; more than one-half of all the flint (SiO^2) ; nearly half of all the chalk, marble, and limestone ($CaCO^3$) consists of the same gas. Almost every one of the materials that enter into the crust of the earth is a compound of oxygen.

The various compounds are studied under the different elements that are in them united with oxygen. Here all that is necessary is to point out the general nature of the compounds and method of naming them.

If oxygen is combined with one element, whilst the oxygen makes up the whole of the chlorous or electro-negative radical, an oxide results. If more than one atom of oxygen is present the prefixes *di*, *tri*, *tetra*, *penta*, are used. The terms basylous and chlorous radicals are based upon the comparison of all compounds with hydrogen chloride (HCl). The part of a compound corresponding with the hydrogen of hydrogen chloride is the basylous, the part corresponding with the chlorine is the chlorous, radical.

H^2O = Hydrogen oxide.
CO^2 = Carbon dioxide.
N^2O^3 = Nitrogen trioxide.
N^2O^4 = Nitrogen tetroxide.
P^2O^5 = Phosphorus pentoxide.

Sometimes two oxides of the same element are distinguished by the ending of the first word in the double name. Thus FeO, ferrous oxide, is marked off from Fe^2O^3, ferric oxide; N^2O, nitrous oxide, from N^2O^3, nitric oxide.

As a rule, oxides with a small number of atoms of oxygen are alkaline, as in the case of sodium oxide (Na^2O), or neutral, as in the case of water (H^2O). Those with a larger number are often acid, as carbon dioxide and phosphorus pentoxide.

When another element is combined with the oxygen in the chlorous radical the termination is *ite* or *ate*, as previously explained.

(To be continued.)

Lessons in Latin.

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KEY TO EXERCISES.

EXERCISE 51.

A.

1. I was about to come to that (degree) of miseries. 2. You seem to be ignorant to what (a pitch) of madness you have gone. 3. In whatever lands and nations

the rights of Roman citizens have been violated, it concerns the common cause of liberty. 4. The day before that day he came into the Senate. 5. Sulpicius Gallus studied Greek literature most of all the nobles. 6. I could do nothing more at that time than weep. 7. It is said by the Stoics to be the highest good to live suitably to nature. 8. Waters are drunk more pleasantly from the spring itself. 9. Lo! four altars; lo! two to you, O Daphnis, and two altars to Phœbus. 10. He who perceives the causes of things the most sharply and quickly, is held the most prudent and wisest in the matter of right.

B.

1. *Positive.*	*Comparative.*	*Superlative.*	*English.*
Pulchre	pulchrius	pulcherrime	fairly
Plane	planius	planissime	plainly
Frigide	frigidius	frigidissime	coldly
Honeste	honestius	honestissime	honestly
Misere	miserius	miserrime	miserably

2. Velociter, *swiftly;* acriter, *sharply;* dupliciter, *doubly;* eleganter, *elegantly;* decenter, *decently;* celeriter, *quickly.*

3. Raptim, *swiftly;* sensim, *perceptibly;* statim, *immediately;* conjunctim, *conjointly;* cursim, *in full speed;* separatim, *separately.*

4. Cœlitus, *heavenly;* radicitus, *from the roots;* humanitus, *humanly;* funditus, *from the foundations;* divinitus, *divinely.*

5. Proxime Hispaniam Mauri sunt. 6. Sibi inutiliter vivit. 7. Instar montis equum divina Palladis arte ædificant. 8. Abunde fabularum audivimus. 9. Galli fortiter pugnaverunt. 10. Carthaginienses fortissime pugnaverant.

EXERCISE 52.

A.

1. Augustus was so overcome by the slaughter under Varus, that he sometimes dashed his head against the doors, crying out, 'O, Quinctilius Varus, give me back my legions!' 2. Make yourself to (a strong way of saying 'do') think that some time you must give up an account of your life. 3. You must look at the mind of a man, not his countenance. 4. Whilst the swift age of first (early) time flourishes, use (it). 5. Hold fortune with hands squeezed (together); it is slippery, and cannot be held unwillingly (lit., unwilling). 6. Q. Metellus, after the death of Scipio Africanus, his enemy, having turned towards his sons, said, 'Go, celebrate his funeral rites; you will never see the funeral of a greater citizen.' 7. Whilst strength and years permit you, endure labours. 8. Cæsar, before he crossed the Rubicon, says, 'We must go whither the will of the gods and the iniquity of our enemies calls us—the die must be thrown.' 9. 'Lead,' I say, 'the unwilling wheels over his very face' (said by Servia, wife of Tarquin, when she saw her father's dead body in the street).

B.

1. Rebus angustis animosus et fortis appare. 2. Cura, amice, ut valeas, et adjuva nos tuâ sententiâ. 3. Eum terrorem, quem tibi rerum novitas attulerit, depellito. 4. Sperne voluptatem; nocet empta dolore voluptas. 5. Incertum est quo te loco mors expectet: itaque tu illam omni loco expecta. 6. Causam investigato in re nova atque admirabili, si poteris: si nullam reperies, illud tamen exploratum habeto, nihil fieri potuisse sine causâ. 7. Quotiens aliquid conaberis, te simul et ea, quæ paras ipse, metire. 8. Sic vive cum hominibus, tanquam Deus videat; sic loquere cum Deo, tanquam homines audiant. 9. Quod dubitas, ne feceris.

EXERCISE 53.

A.

1. If you wish to abolish avarice, you ought to abolish her mother, luxury. 2. Do not be ashamed to be willing to be taught what you did not know. 3. To know anything is a praise (Eng., praiseworthy); to wish to learn nothing is a shame (Eng., shameful). 4. It makes a great difference whether any one is unwilling or does not know (how) to sin. 5. If you wished to be stripped of vices, you must go a long way from the examples of vices. 6. He would rather be a prince than seem one. 7. Your fathers wished Corinth to be utterly destroyed. 8. Why do you wish him to be defended? 9. The greatest kindnesses are those which we receive from our parents whilst we either do not know, or are unwilling (to receive them). 10. Let him, who wishes to arrive whither he determined, follow one way.

B.

1. Utile est puero habere, quos imitari primum, mox vincere, velit. 2. Impellimur natura, ut prodesse velimus quam plurimis. 3. Flere palam non vult. 4. Brutus clamore Quirites concitat, et regis facta nefanda refert. 5. Non expectatâ vulnus ab hoste tuli. 6. Di faciant, ne tu strenuus esse velis. 7. Maluit servire gloriæ suæ quam opibus. 8. Non dare, Mæcenas, vellem si plura, negares. 9. Dicit se bonus homo esse malle quam videri. 10. Si vultis nihil timere, cogitate omnia esse timenda.

LESSON LIV.

INDIRECT OR OBLIQUE NARRATION.

439. Of the two following quotations from a newspaper, the former is called 'Direct Narration,' and the other 'Indirect or Oblique Narration,' in which not the actual words, but the meaning is given:—

(1) 'The Attorney General said:—My Lord, as this matter has been made public, I desire, with your Lordship's permission, to make a statement, and in this respect Mr. Adams, who is now in court, joins.'

(2) 'Sir S. Waterlow said he was sure there was no idea on the Liberal side that any vote would be taken that evening that would imperil the safety of the Government.'

440. If the report of a speech is changed from direct to oblique narration, the principal verbs of the former, which are in the indicative mood, are put into the infinitive mood; other indicative moods, which are in dependent clauses, are put into the subjunctive mood, and other moods remain as they were. Cæsar always reported speeches, including his own, in this way. We, therefore, often only find one single verb in the indicative mood in an entire chapter of his, such as 'He said,' or something synonymous, and Livy sometimes omits even this indicative mood, leaving it to be supplied by the reader.

441. VOCABULARY, 54.

English.	*Latin.*		*English Deriv.*
To carry into	inferre	P. R. intul	3rd R. illative
So much-(by)-as	tanto..quanto (lit., and by so much)		
Bold	audax	R. audac	audacious
Soul / Mind	ănĭmus	G. animi	unanimous

Force / Authority	vis, G. vis, Acc. vim., Ab. vi., Pl. vires (42)		
To ward off	arcēre	R. arc	No 3rd R.
To set fire to	accendere	P. R. accend	3rd R. accens
Besides	præterea, adv.		
To stir up	stimulāre	R. stimul	stimulant
Injury	injuria	G. injuriæ	injurious
Indignity	indignitas	G. indignitatis	
Punishment	supplicium	G. supplicii, n.g.	
To demand	depo cere	P. R. dopoposc	No 3rd R.
To give up	dēdĕre	R. R. dedĭd	3rd R. dēdit
Torture	cruciatus	G. cruciatūs	excruciate
To visit	afficere	P. R. affēc	d R. affect
Cruel	crūdēlis	R. crudel	
Proud	superbus	R. superb	superb
Judgment	arbitrium	G. arbitrii	arbitrate
To limit	circumscribere (see 47)		
To shut in	inclūdere	P. R. incīs	3rd R. incīs
Boundary	terminus	G. termini	terminate
Nor	nĕque		
To lay down / To determine	statuere	P. R. statu	3rd R. statūt
To complain of	quĕri, dep.		P. R. quest
To observe	observare	R. observ	observation
Ever	usquam		
To rescue	vindicare	R. vindic	vindicate
Sluggish	ignavus	R. ignav	
Journey (route)	iter	G. itinĕris	itinerant
Necessary	nĕcesse, adv.		
To conquer	vincĕre	P. R. vīc	3rd R. vict
Rather	potius, comp. adv.		
To undergo	oppetĕre	P. R. oppetiv	oppetit
To fix	figere	P. R. fixi	3rd R. fix
For	ĕnim, conj.		
Contempt	contemptus	G. contemptūs	
Weapon	tēlum	G. teli, n.g.	
Sharp	ācer, acris, acre	G. acris	acrid
To obtain	impĕtrāre	R. impetr	
End	exitus	G. exitūs	exit
Speech	ōrātio	G. orationis	
To remain	rēmānĕre	P. R. remans	3rd R. remans
Territory	finis	G. finis, c. g.	confines
To defend	tuĕri, dep.		3rd R. tuitus or tūtus
Another's	alienus -na -num	R. alien	alienate
To occupy	occupare	R. occup	occupation
To make empty	văcāre	R. vac	vacate
Especially	præsertim, adv.		
To be allowed	licēre (used impersonally)		
Among / At the house of	apud, prep. gov. acc.		

442. EXERCISE 54.

A.

The conclusion of a speech of Hannibal's to his soldiers, as given in direct narration by Livy:—

Inferimus bellum (16) in Italiam, tanto audacius pugnaturi (10) quam hostes (10), quanto major (49) est animus inferentis vim quam (48) arcentis. Accendit præterea et stimulat animos dolor (39), injuria, indignitas. Ad supplicium depoposcerunt me ducem (2) primum (47), deinde (19) vos (35) omnes (29); ('quos' understood) deditos ultimis (49) cruciatibus affecissent. Crudelissima ac (33) superbissima gens (38) omnia (29) sui (20) arbitrii facit (43); circumscribit includitque nos (35) terminis montium (20) fluminumque (5) neque eos (37) quos (27) statuit, terminos observat. Duos (44) consules (17) hujus (37) anni (17), unum (44) in Africam, alterum (31) in Hispaniam (19) miserunt (43). Nihil (31) usquam nobis (35) relictum est (26), nisi (43) quod (27) armis (36) vindicaverimus. Illis (37) timidis (20) et ignavis esse licet (48), quos (27) sua (20) terra (8) per (3) tuta (49) itinera fugientes (27) accipiet (28): vobis (35) necesse est fortibus (51) viris (18) esse, et aut (53) vincere aut (53) in proelio (26) potius quam (48) in fuga (35) mortem (8) oppetere. Si (15) hoc (37) bene (42) fixum in animo est, iterum (20) dicam (15) vicistis; nullum (31) enim contemptu mortis (8) telum ad vincendum acrius homini (5) ab dis (for 'deis,' 27) immortalibus (40) datum (12) est.

B.

The conclusion of a speech of Cæsar's, reported by himself in indirect narration:—

1. Ad hæc (37) Cæsar respondit, (18) sed (6) exitus fuit orationis, 'Sibi (35) nullum (31) cum (20) his (37) amicitiam (45) esse posse (50), si (15) in Gallia remanerent; neque verum (29) esse, qui (27) suos (20) fines tueri non potuerint (50), alienos occupare; neque ullos (31) in Gallia vacare agros (5) qui (27) dari (12), tantæ (40) præsertim multitudini (41), sine (31) injuria possint (50). Sed (6) licere, si (15) velint (53), in Ubiorum finibus considere (37), quorum (27) sint (38) legati (41) apud se (35) et de (26) Suevorum (Eng., Suevi) iujuriis querantur, et a se (35) auxilium (37) petant (9): hoc (37) se (35) ab iis (37) impetraturum ('esse,' understood).'

2. Write the above passage in direct narration.

LESSON LV.

INTERROGATIVE PARTICLES.

443. There are three ways of asking questions—

(1) Asking for information, as 'Are you well?'

(2) Asking with a negative, which expresses the expectation of an affirmative answer, as 'Are you not going out?'

(3) Asking in a way which expresses the expectation of a negative answer, as 'Are you afraid of that man?'

444. In the first kind, 'ne' is appended to a word (generally the first) of the sentence, unless, of course, some interrogative pronoun or adverb has been used (see par. 404), as 'Putas-ne me istud facere potuisse?' 'Do you think that I was able to do that?'

445. In the second kind, the 'ne' is appended to the 'non,' and the sentence usually commences with this compound, 'nonne,' as 'Nonne hunc in vincula duci imperabis?' 'Will you not command this man to be led to prison (lit., into chains)?'

446. In the third kind, the sentence begins with 'num,' or 'an,' as 'Num me putas tam dementem fuisse?' 'Do you think I have been so mad?' Of which the real meaning is, 'You don't think, do you, I have been so mad?'

447. Frequently these interrogative particles are omitted, especially in poetry, and the interrogation is only expressed by the tone of the speaker or the context of the writer.

448. VOCABULARY 55.

English.	*Latin.*		*Eng. Deriv.*
To slay	mactāre	R. mact.	
To be angry	irasci, dep. ĕ verb.	exc. 3rd R.	irascat
To overcome / To survive	sŭpĕrāre	R. super	insuperable
Air / Breeze	aura	G. auræ	
Lie	mendācium	G. mendacii, n.g.	mendacious
To lade	ŏnĕrāre	R. oner	onerous
World	orbis	G. orbis, m.g.	orb
Cinders	cīnis	G. cinĕris, c.g.	
To be ignorant of	ignōrāre	R. ignor	ignore
Tyrant	tyrannus	G. tyranni	tyrannous
To expel	expellĕre	P. R. expul	3rd R. expuls
To expose	expōnĕre	P. R. expŏsu	3rd R. expŏsit
She wolf	lūpa	G. lupæ	
With young	fœtus -ta -tum	R. fœt	
Twins	gemelli	O decl., no sing.	
To believe / To trust	crēdĕre, gov. dat.	P. R. credĭd	3rd R. crēdit
How	quām, adv.		
Event / Misfortune	cāsus	G. casūs	casuistry
To take away	ădĭmere	P. R. adem	3rd R. adempt
Nurse	nūtrīcŭla	G. nutriculæ	
To pray for	vŏvēre	P. R. vōv	3rd R. vōt
Nurseling	ālumnus	G. alumni	
Thus	ĭtă, adv.		
Courageous	ĭmpĭgĕr -gra -grum	R. impigr	

Spend riotously / Wound	lăcĕrāre	R. lacer	lacerate
Grecian	Dănaus -a -um	R. Dana	
To impute / To turn	vertĕre	P. R. vert	3rd R. vers
Fault	vĭtĭum	G. vitii	vitiate
To enflame	incendere	P. R. incend	3rd R. incens
Desire	cŭpĭdĭtas	G. cupiditātis	cupidity
Well	bĕnĕ, adv.		
Danger	pĕrĭcŭlum	G. periculi, n.g.	

449. EXERCISE 55.

A.

1. Nonne hunc (37) summo (49) supplicio (54) mactari imperabit (36)? 2. Tune (35) ille (37) Æneas? 3. Num aliquis (45) irascitur tibi (35)? 4. Quid (30) puer (7) Ascanius, superatne et vescitur (45) aurâ? 5. Te (35) quibus (27) mendaciis homines (5) levissimi (49) oneraverunt? 6. Num minus (38) hic (37) toto (31) est altior (20) orbe cinis? 7. Quod (translate 'and . . . . this') Remus ignorans, humiles (49) contemnere (49) muros (9) cœpit (37); et 'His (37) populus' (16), dicere, (15) 'tutus (49) erit (38)?' 8. Nonne Dionysius tyrannus, Syracusis (50) expulsus, Corinthi pueros (7) docebat (3)? 9. Vĕnit (19) ad expositos mirum! ('marvellous to say') lupa fœta gemellos. Quis (30) credat pueris (7) non nocuisse (50) feram (50)? 10. An ego possum (50), quum (13) ignorem, quàm sit (38) vir (18) bonus (20)?

B.

1. What (30) event has taken-you (35)-away from me (35)? 2. What (30) greater (49) (thing) can a nurse pray for (her) dear (Lat., sweet, 29) nurseling? 3. Whence (41) will there be (38) to you (35) (Eng., you have) a wife (9) who (27) can love (2) you (35) thus? 4. Who (30) has (7) not a thousand (44) causes (37) for grief (39)? (What case is 'for' a sign of here?) 5. Why (33) does the courageous Hector spend-riotously the Grecian riches (53)? 6. Have not these (37) letters (12) (after) being read (Lat., recitāre) caused (Lat., made, 43) great (20) grief (39)? 7. Do you hope (49) that this (37) will be (38) a credit (Dat. of laus, G. laudis) to you (35) which (27) you impute as a fault (Dat.) to me (35)? 8. Have we all (29) been enflamed with the desire of living (48) well? 9. Was (38) not Epaminondas fond (46) of hearing (4)? 10. Is danger ever conquered (54) without (31) danger?

LESSON LVI.

'EO' AND ITS COMPOUNDS, AND OTHER VERBS.

450. One of the commonest verbs in the Latin language is 'ire,' *to go*, of which the perfect root is 'iv,' and the 3rd root 'it,' though the passive voice is necessarily never found, except in an impersonal sense.

It is thus declined :—

	Indic.	*Sub.*	*Imper.*	*Inf.*	*Part.*
Pres. Sing.	eo	eam		ire	iens
	is	eas	i		A. euntem -iens
	it	eat	ito		G. euntis
Plur.	imus	eamus			etc.
	itis	eatis	ite		
	eunt	eant	eunto		
Imp. Sing.	ibam	irem			
	ibas	ires			
	etc.	etc.			
Fut. Sing.	ibo		iturus esse		iturus
	ibis	ito			
	ibit				
Plur.	ibimus				
	ibitis	itote			
	ibunt				

Perf., etc., regular, with root 'iv,' but the 'v' is generally dropped in the compounds. Gerunds, or cases of verbal noun; Acc. 'eundum,' G. 'eundi,' D. and Ab. 'eundo.'

451. 'Aio,' *I say*, is thus declined :—

	Indic.	*Sub.*		*Indic.*
Pres. Sing.	aio		*Imp. Sing.*	aiebam, etc.
	ais	aias		
	ait	aiat	*Perf. Sing.* 2.	aisti
Plur.	—	—	*Plur.* 2.	aistis
	—	—		
	aiunt	aiant		

452. 'Inquam' is thus declined :—

	Indic.	*Imperat.*	*Part.*
Pres. Sing.	inquam		inquiens
	inquis	inque	
	inquit	inquito	
Plur.	inquimus		
	inquitis		
	inquiunt		
Imp. Sing.	inquiebam, etc.		
Fut. Sing. 2.	inquies		
	inquiet		
Plur. 3.	inquient		
Perf. Sing.	inquii		
	inquisti		
Plur. 2.	inquistis		

453. Other defective verbs have so few forms that they will be noticed as they occur in the exercises.

454. The verb 'veneo,' *I go for sale*, is a compound of 'eo,' with a future 'venibo,' etc. So also 'queo,' *I am able*, and 'nequeo,' *I am not able*, are declined like 'eo,' with futures 'quibo' and 'nequibo'; but the imperatives and some other parts are not found.

455. There are a few verbs which, in the tenses derived from the present root, have an active form with a passive meaning—of which the commonest is 'fio,' *I am made*, or *I become*—whose perf. tenses are 'factus sum,' 'factus eram,' etc.

456. It is thus declined :—

	Indic.	*Sub.*	*Imperat.*	*Inf.*	*Part.*
Pres. Sing.	fio	fiam		fieri	
	fis	fias			
	etc.	etc.			

Imp. fiebam and *Fut.* fiam are regular.

457. VOCABULARY 56.

English.	*Latin.*		*Eng. Deriv.*
To depart	ăbīre	2nd R. abi	3rd R. ăbit
To perish	pĕrīre	2nd R. peri	No 3rd R.
To approach	sŭbīre or ădīre	2nd R. subi / 2nd R. adi	3rd R. subit / 3rd R. adit
To go for sale / To be sold	venire	2nd R. veni	3rd R. ven
To go into / To begin	inīre	2nd R. ini	init
To pass	transire	2nd R. transi	3rd R. transit
To appear	prŏ-d-īre	2nd R. prodi	3rd R. prodit
To return	rĕdīre	2nd R. redi	3rd R. redit
To perish	interire	2nd R. interi	3rd R. interit
To go around	circumīre	2nd R. circumi	3rd R. circumit
To be able	quīre	see par. 454.	
To be unable	nequīre	see par. 454.	
I say	aio	see par. 451.	
I say	inquam	see par. 452.	
To carry	portāre	R. port	porter
Manner	mos	G. mōris, n.g.	moral
Oracle	ōrāculum	G. oraculi, n.g.	
To see	cernĕre	2nd R. crĕv	3rd R. crēt
Shining	fulgĭdus -da -dum	R. fulgid	
Cold	frigus	G. frīgoris	refrigerator
To shear off	dētondĕre	P. R. detons	3rd R. detons
Leaf	frons	G. frondis	frond
Obscure	obscurus -ra -rum	R. obscūr	
To desire	pĕtĕre	2nd R. pĕti	3rd R. petit
Instrument	instrumentum	G. instrumenti, n.g.	
Slothful	segnis -ne	G. segnis	
Difficult	arduus -a -um	R. ardu	
To try	experire, dep.		3rd R. expert
Worthy	dignus -na -num, gov. abl.	R. dign	dignity

Admiration	admīrātio	G. admiratiōnis	
Although	ĕtiamsi, conj.		
Daily	quŏtīdiānus -na -num	R. quotidian	
To furnish	compārare	R. compar	
Prudence	prūdentia	G. prudentiæ	
Ignorance	inscītia	G. inscitiæ	
Unusual	insolitūs -ta -tum	R. insolit	
To become	fieri	see par. 436.	3rd R. fact
Not	haud		
Indeed	quidem, adv.		
Humanity	hūmānĭtas	G. humanitātis	
To form	effingere	P. R. effinx	3rd R. effict
To remain	permānēre	P. R. permans	No 3rd R.
Patience	pātientia	G. patientiæ	
To seek	quæro	P. R. quæsīv	3rd R. quæsīt
Goodwill	grātia	G. gratiæ	
Otherwise	ălĭter, adv.		
Manner	mŏdŭs	G. modi	mood
To delay	mŏrāri, dep.		No 3rd R.
Living	vīvus -va -vum	R. viv	vivify
Perfumed	ŏdōrātus -tă -tum	R. odorat	
To besprinkle	perfundere	2nd R. perfūd	3rd R. perfūs
Hair	capillus	G. capilli	capillary
Sad	tristis	G. tristis	
Image	imāgo	G. imaginis	
To be without	ĕgēre, gov. ab.	No 2nd or 3rd Roots.	

458. EXERCISE 56.

A.

1. Bonis (20), quod (27) bene (55) fit, haud perit. 2. Homines (5) quidem pereunt, ipsa (40) autem (38) humanitas, ad (10) quam (27) homo (5) effingitur, permanet. 3. Patientia quæri debet (46), quòd 'because' gratiâ impetrari (54) nequit. 4. Ain' (for 'ais-ne') tu? An (55) tu (35) aliter id (37) scire (14) non potes (50)? 'Nullo (31) modo.' 5. 'I mea' (20), dixit (15), 'avis (49), ne (par. 423) quid (for 'aliquid,' 45) pia (48) sacra (40) moretur; et tenuem (Eng., 'stagnant') vivis fontibus (12) affer (52) aquam' (7). 6. Ibat odoratis humeros (43) (underst. 'as to') perfusa capillis. 7. Cùm (for 'quum,' 13) subit illius (37) tristissima noctis (29) imago, quæ (27) mihi (35) supremum (49) tempus (17) in urbe (7) fuit (38). 8. Imperiis (19) egere suis (20): nec (48) credere (55), quivi. 9. Ineuntis ætatis (44) inscitia senum (46) prudentiâ regenda (4) est. 10. Ita (17) naturâ (46) comparati sumus, ut quotidiana, etiamsi admiratione digna sunt, transeant, contra (Eng., 'on the other hand') minimarum (49) quoque (20) rerum (13) (partitive genitive) si (15) insolitæ prodierunt spectaculum (14) dulce (29) fiat.

B.

1. Many (20) (things) will become easy (29) by trying, which (27) seem (51) difficult to the slothful. 2. Many (20) pass through life (11) whilst they are seeking the instruments of life (11). 3. Do you wish (53) to become rich (46)? Wish (53) (pres. sub.) to desire (perf. inf.) nothing (31). 4. I labour (13) to be (38) short (49); I become obscure. 5. The leaves shorn-off the trees (1) by the cold return. 6. We are often (35) not-able to see the shining constellations ('star,' 34). 7. May all thy race so (50) perish with thee (35) (append the 'cum'). 8. Therefore (Lat., 'quin') approach (pres. sub.) the prophet (37), and demand (54) (pres. sub.) the oracles with (thy) prayers (35). 9. He moved (43) in the manner of a wolf (8) going round enclosed (Lat., 'shut in,' 54) sheep. 10. Whom (27) they say ('aio') carries the Penates (same word) of his fathers (35) with (append 'cum') him (35).

—o—

Recent Inspection Questions.

[The Editor respectfully solicits contributions—all of which will be regarded as STRICTLY PRIVATE*—to this column. For obvious reasons, it cannot be stated in which district the questions have been set.]*

Arithmetic.

INFANTS—DIVISION I.

(*Nos. dictated.*)

(1)	(2)
25	48
37	25
48	—
—	23
110	—
—	

(3) Six little children; how many legs?
(4) Four little boys: how many eyes?
(5) Questions on *two* and *three* times multiplication tables.

INFANTS—DIVISION II.

Mental only.—How many are 15 and 4; 17 and 5; 8 and 3.

STANDARD I.

(*Nos. dictated.*)

(1)	(2)	(3)
205	314	758
197	76	67
—	—	409
8	238	82
—	—	560
		—
		1876
		—

STANDARD II.

(*Sums dictated.*)

(A.)

(1) 40,203
5,694
—
34,509
—

(2) 6,798 × 709 = 4,819,782. Ans.

(3) 15,010 ÷ 8 = 1876 + 2. Ans.

(4) A boy should have been at school 407 times. He was ill 73 times and absent 19 times. How many times was he at school? = 315. Ans.

(B.)

(1) 23,400
8,530
—
14,870
—

(2) 9,708 × 860 = 8,348,880. Ans.

(3) 23,008 ÷ 9 = 2,556 + 4. Ans.

STANDARD III.

A Card.

(1) Divide eight hundred and seventy-six thousand and fifty by four hundred and thirty-nine.

$1995\frac{245}{439}$. Ans.

(2) A boy saved out of his wages £3 18s. 10½d. Out of this he bought a suit of clothes for £2 19s. 11d., a pair of boots for 5s. 6d., a cap for 1s. 8¾d.,

and a necktie for tenpence. How much money remained unspent? 10s. 10$\frac{3}{4}$d. Ans.

(3) Add together:—£80,970 18s. 10$\frac{1}{2}$d., £89 17s. 11$\frac{3}{4}$d., £8,016 19s. 9$\frac{3}{4}$d., £4,009 15s. 7$\frac{1}{2}$d., £807 10s. 8$\frac{3}{4}$d., and £6,005 0s. 3$\frac{1}{2}$d.
£99,900 3s. 3$\frac{3}{4}$d. Ans.

(4) Find the difference between £7,006 6s. 11$\frac{3}{4}$d., and £20,020 0s. 3$\frac{1}{2}$d. £13,013 13s. 3$\frac{3}{4}$d. Ans.

STANDARD IV.

A Card.

(1) Divide three thousand eight hundred and eighty-nine pounds seventeen shillings and sevenpence halfpenny by two hundred and forty-six.
£15 16s. 3$\frac{0}{1}$d. $\frac{6}{123}$. Ans.

(2) A workman is paid tenpence an hour and works 9 hours a day. How many days must he work to earn twenty-one pounds at this rate?
56 days. Ans.

(3) How many acres are there in a farm which contains eight hundred and ninety-four thousand three hundred and eleven square yards?
184 acs. 3751 yds., or 184 acs. 3 roods 4 per. Ans.

(4) Multiply nine hundred and seventy-eight pounds eighteen shillings and fivepence three farthings by eighty-seven. £85,166 7s. 8$\frac{1}{4}$d.

STANDARD V.

A Card.

(1) If 80 pigs cost £360, how many can I buy for £1,215?
270 pigs. Ans.

(2) Find the cost of 9,560 articles at 11s. 1$\frac{3}{4}$d.
£5,327 14s. 2d. Ans.

(3) Make out and receipt the following bill:—

	s.	d.
1 qr. 23 lbs. soap at 2$\frac{3}{4}$d. per lb...	11	8$\frac{1}{4}$
18 lbs. candles at 7$\frac{1}{2}$d. per lb. ..	11	3
10 gals. 3 qts. oil at 1s. 2d. per gal.	12	6$\frac{1}{2}$
4$\frac{1}{2}$ lbs. starch at 4$\frac{1}{2}$d. per lb. ..	1	8$\frac{1}{4}$
	£1	17 2 Ans.

(4) What will the making of 1 m. 4 fur. 10 poles of road cost at £103 0s. 4d. per mile?
£157 14s. 10$\frac{5}{8}$d. Ans.

STANDARD VI.

A Card.

(1) If 15s. 6$\frac{3}{5}$d. be paid for 1$\frac{3}{4}$ cwt. of coal, what would be the cost of 4$\frac{5}{16}$ cwt.? £1 18s. 4d. Ans.

(2) What sum of money must be lent out at 5 per cent. per annum so as to yield £83 15s. as interest for 3 years?
£558 6s. 8d. Ans.

(3) Add together £·48267, ·3142s., and 11·9292d.
10s. 11·5404d. Ans.

(4) Reduce $\frac{11}{55}$ to a decimal fraction. ·20$\dot{3}\dot{7}$. Ans.

STANDARD VII.

A Card.

(1) If 12 men make 240 boxes in 20 days of 8 hours each, how long will they be in making 360 boxes if they work 10 hours daily at the same rate?
24 days. Ans.

(2) A man started on a fortnight's journey with £7 0s. 10$\frac{1}{2}$d. in his pocket. At the end of a week he found that he had spent $\frac{3}{7}$ of his money. How much could he afford to spend daily for the remainder of his journey? 11s. 6d. per day. Ans.

(3) If a shopkeeper takes 5 per cent. off the price for ready money, what should be the cash price of an article which is marked at 12s. 3d.?
11s. 7$\frac{13}{20}$d. Ans.

(4) In a school of 360 children 10 pay 6d. per week, 80 pay 4d., 104 pay 3d., 75 pay 2d., and the rest pay 1$\frac{1}{2}$d. What was the average sum paid per week by each child? 2$\frac{3}{7}\frac{1}{2}\frac{7}{0}$d. Ans.

Dictation.

INFANTS—DIVISION I.

Bird. Boy. Horse. Nice.
Write all the capital letters from memory.

STANDARD I.

Talk. School. Pretty. Grass. Kind.
Bird. Water. Master. Quick. Young.

STANDARD II.

Its horns are made into glue, and its bones into spoons and other useful articles. Almost any other animal than the reindeer would starve in a Lapland winter, where the ground is covered with snow for many months. With its strong horns and hoofs, however, it is able to scrape away the snow.

STANDARD III.

This discovery fully accounted for the strange noises the dame had heard. The rats in the cellar had found out the wine, and had taken means to let all the other rats in the parish know. They assembled, and, being quite a family party, succeeded in finishing the wine.

STANDARD IV.

It was thought not only advantageous to the home country to get rid of convicts, but also beneficial to the convicts themselves; they could begin life again under new conditions far removed from their old associates, and with the certainty of success if they became honest and industrious. The convicts laid out cities and constructed roads and harbours; many of them were hired out as servants or farm labourers, and the colonists were glad of their services, till the discovery of the gold mines brought abundance of labour; then, at the request of the colonists, transportation, as a punishment, ceased.

Grammar.

STANDARD II.

Oral questions on nouns and verbs.

STANDARD III.

In your dictation place under nouns one line; under adjectives, two lines; under verbs, three lines; under adverbs, four lines; and under pronouns, five lines.

STANDARD IV.

Parse:—'To their great surprise a partridge got up from under a harrow with a worm in its mouth.'

Show how these words are used, and say what they are:—Or, each, few, but, green.

STANDARD V.

Parse the words in italics, and analyse the whole sentence:—

'*Well had* the *boding tremblers* learned to trace
The day's *disasters in his* morning's face.'

Form nouns from:—Humble, enjoy, honest, poor, scarce, dare.

Answer: Humbleness or humility, enjoyment, honesty, poorness or poverty, scarcity, daring.

STANDARDS VI. AND VII.

Parse the words in italics, and analyse the whole:—'*When* the hen is obliged *to leave her nest in search* of food *how punctually does she return* to keep her eggs *warm*.'

Form words (with meanings) from the following prefixes: Ultra, ab, re, pre, pro, com.

Answer: *Ultramarine*—beyond the sea.
abstain—to stand away, or keep from.
repeat—to say over again.
prepare—to get ready beforehand.
produce—to lead out, to bring forth.
compound—to mix together.

Music.

TONIC SOL-FA.

DIVISION I. (INFANTS).

Modulator Ex.: d^1 m s d.

DIVISION II. (STANDARD I.)

Modulator Ex.: d^1 s m l r f r s m t s d^1.

Ear Test: Repeat to *laa:* d^1 m r d; d s m r.

DIVISION III. (STANDARD II.)

Modulator Ex.: d^1 s m l r s m d, etc.

Ear Tests: Repeat to *laa:* d l s f; m s m d.

DIVISION IV. (STANDARDS III.-VII.)

Time Test:

‖ l : l.l : l.l | l :-:- | l : : | l.l : l.l : l.l | l :-:- | l : : l ‖

Ear Tests: d^1 t l d^1; s l s d^1; l s fe s; l t l.

Modulator Ex.: d s m l r m d s t l s d f m r ^{s}d d s_1 m_1 s_1 l_1 s_1 d ^{d}s m r d ^{f}d s_1 m_1 f_1 s_1 d f m s d ^{d}f m r d f l s l s fe s d^1 ta l t d^1 s l f m s d. m l t d^1 t l m s l s d^1 t l se l m r d r m m_1.

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ **When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.**

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

Arithmetic.

1. J. W.—In making gold thread for embroidery, a cylinder of silver weighing 360 oz. Av. is cased with one of gold weighing 6 oz., and this mass is drawn through a series of circular holes, continually diminishing in diameter, until it becomes so thin that 202 ft. in length weigh only one dram; what is now the length of the thread?

Weight of thread = 360 oz. + 6 oz.
= 366 oz.
= (366 × 16) drs.
= 5,856 drs.;
∴ Length of thread = (202 × 5,856) ft.
= (202 × 1,952) yds.
= 394,304 yds.
= 224 miles 64 yds. Ans.

2. INQUISITIVE.—If a person owe a certain sum payable in 2½ years hence, in what time ought he to pay ⅔ of the debt, so that he may retain the remainder for 3½ years? (*Dublin University.*)

(⅓ × time in years) + (⅔ × 3½) = 2½,
(⅓ × time in years) + (⅔ × ½) = 2½,
⅓ × time in years = 2½ − ⅔
= 1⅚,

$$\therefore \text{Time} = \left(\frac{5}{\cancel{6}} \times \frac{\cancel{6}}{3}\right)_2 \text{ year}$$

= ⅚ year, or 10 months. Ans.

3. ANNIE LINDSAY.—Supposing the cost of digging a trench to depend upon the depth to which it is sunk, as well as the quantity of earth taken out, and that the cost of digging a trench 3 feet broad by 8 feet deep is 9d. per yard, what would be the cost of digging a trench 120 yards long, 5 feet broad, and 10 feet deep?

1 yd. × 3 ft. × 8 ft. : 120 yds. × 5 ft. × 10 ft. } :: 9d. : Cost.
8 ft. : 10 ft. }

$$\tfrac{2}{3} \text{ cub. yds.} : \frac{\cancel{40} \times 5 \times 10}{\cancel{9}_3} \text{ cub. yds.} \Big\} :: \tfrac{3}{4}\text{s.} : \text{Cost}$$

4 : 5

$$\therefore \text{Cost} = \frac{\cancel{40} \times 5 \times \cancel{9} \times 5 \times \cancel{3}_1\text{s.}}{\cancel{8} \times 4 \times \cancel{4}_2}$$

$$= 18\tfrac{7}{8}\text{s.}$$
= 234⅜s.
= £11 14s. 4½d. Ans.

4. DISCIPLINUS.—A man set out to market with £100 in his pocket, with which he bought 100 animals, which were of four kinds; for the first kind he paid £10 each, for the second £1 each, for the third 5s. each, and for the fourth kind 1s. each. How many had he of each kind?

Average price = £100 ÷ 100 = £1;
Difference between average price and price of first kind
= £10 − £1
= £9;

Suppose we take the average price of third and fourth kinds at 2s.,
Then, 3rd kind : 4th kind :: 3s. − 2s. : 5s. − 2s.,
:: 1 : 3;

Difference between average price and average price of 3rd and 4th kinds
= £1 − 2s.
= 18s.;

Then, 1st kind : 3rd and 4th kinds :: 18s. : £9,
:: 18s. : 180s.,
:: 1 : 10;

∴ He could have

		£	s.
20	2 at £10 =	20	0
	5 „ 5s. =	1	5
	15 „ 1s. =	0	15
	78 „ £1 =	78	0
	100	£100	0

Or,

		£	s.
40	4 at £10 =	40	0
	10 „ 5s. =	2	10
	30 „ 1s. =	1	10
	56 „ £1 =	56	0
	100	£100	0

Or,

		£	s.
60	6 at £10 =	60	0
	15 „ 5s. =	3	15
	45 „ 1s. =	2	5
	34 „ £1 =	34	0
	100	£100	0

Or,

		£	s.
80	8 at £10 =	80	0
	20 „ 5s. =	5	0
	60 „ 1s. =	3	0
	12 „ £1 =	12	0
	100	£100	0

5. D. W. LL.—An elastic ball after striking the ground rises to $\frac{4}{7}$ of the height from which it fell. After striking the ground a third time it rises $3\frac{7}{32}$ inches; from what height did it fall at first? (*Brook-Smith.*)

$(\frac{4}{7} \times \frac{4}{7} \times \frac{4}{7})$ of Height $= 3\frac{7}{32}$ inches,
$\frac{64}{343}$ of Height $= 3\frac{7}{32}$ inches,
∴ Height $= (\frac{343}{64} \times 3\frac{7}{32})$ in.
$= 1\frac{3}{4}\frac{4}{1}\frac{3}{4}\frac{3}{2}$ in.
$= 20\frac{23}{128}$ in. Ans.

6. SOUTHWICK.—Find the square root of $3\frac{3}{17}\frac{4}{17}$. (*Rick's 'Arithmetic for Pupil Teachers.'*)

$3\frac{3}{17}\frac{4}{17} = 3{\cdot}32700135\,6852\ldots$

3'32'70'01'35'68'52(1·824006
1
28 | 232
224
362 | 870
724
3644 | 14601
14576
3648006 | 25356852
21888036
3468816

∴ Square root of $3\frac{3}{17}\frac{4}{17} = 1{\cdot}824006\ldots$ Ans.

7. A MISTRESS.—At the siege of Sebastopol it was found that a certain length of trench could be dug by the soldiers and navvies in 4 days, but that when only half the navvies were present it required 7 days to dig the same length of trench. Show that the navvies did six times as much work as the soldiers.

Soldiers and navvies can do the work in 4 days,
„ „ $\frac{1}{2}$ „ „ „ 7 „ ;
∴ Soldiers and navvies can do in 1 day $\frac{1}{4}$ of the work,
„ „ $\frac{1}{2}$ „ „ „ $\frac{1}{7}$ „ ;
∴ $\frac{1}{2}$ navvies can do in one day $\frac{1}{4} - \frac{1}{7}$ of the work
$= \frac{7-4}{28}$ „
$= \frac{3}{28}$ „ ;
∴ Navvies can do in 1 day $(\frac{3}{28} \times 2)$ of the work
$= \frac{3}{14}$ of the work,
And, soldiers „ „ $\frac{1}{4} - \frac{3}{14}$ of the work
$= \frac{7-6}{28}$ „
$= \frac{1}{28}$ „ ;
∴ Work done by navvies : Work done by soldiers
:: $\frac{3}{14}$: $\frac{1}{28}$,
:: 6 : 1.

8. EIDRAH.—A person sells out of the 3 per cents. at 98⅔, and invests in railway stock when £100 shares are at 111. Give the dividend which he should receive on each railway share, in order to gain one per cent. per annum by the transaction. (*Intermediate Arts, London,* 1884.)

£ 98⅔ : £ 100 :: £ 3 : Interest per cent. of first investment.
3
296
74
3
300
75
3
225
£3 $\frac{225}{296}$.

£ 100 : £ 111 :: £ $4\frac{225}{296}$: Dividend of railway shares
$= \frac{111 \times 299}{100 \times 74}$ £
$= \frac{33189}{7400}$ £
$= 4\frac{3189}{7400}$ /. Ans.

9. GENTIL.—Two persons employed in a shop have different salaries, together amounting to 4000 francs per annum; the first spends $\frac{3}{4}$ of his salary, and the second $\frac{5}{6}$; their joint savings amount to 1310 francs a year. What is the salary of each?

(1) Salary of first + Salary of second = 4000 francs,
(2) $\frac{1}{4}$ Salary of first + $\frac{1}{6}$ Salary of second = 1310 francs;
Multiplying (2) by 3,
(3) Then, Salary of first + $\frac{3}{2}$ Salary of second = 3930 francs;
Subtracting (3) from (1),
Then, $\frac{1}{2}$ Salary of second = (4000 − 3930) francs
= 70 francs,
∴ Salary of second person = 280 francs;
And „ first „ = (4000 − 280) francs
= 3720 francs.

10. M. R. S.—A farmer went to market with £100 to spend, and bought 100 head of cattle; for the beasts he gave £10 each, sheep £3 each, and pigs 10s. each. How many of *each* did he bring home?

Average price = £100 ÷ 100 = £1;
Difference between price of beasts and average price = £10 − £1
= £9;
„ „ „ sheep „ „ „ = £3 − £1
= £2;
„ „ „ pigs „ „ „ = £1 − 10s.
= 10s.;

(For first difference.)
No. of beasts : No. of pigs :: 10s. : £9,
:: 1 : 18;

(For second difference.)
No. of sheep : No. of pigs :: 10s. : £2,
:: 1 : 4;

For first difference, (No. of beasts + No. of pigs) must be a multiple of (1 + 18) or 19;
For second difference, (No. of sheep + No. of pigs) must be a multiple of (1 + 4) or 5;
∴ (No. of beasts + No. of pigs) must be (19 × 5) or 95;
∴ No. of beasts = 5,
„ „ sheep = 1,
„ „ pigs = 90 + 4 = 94 } Ans.

11. W. H. M.—By means of the following tables of the present value of an annuity of £1 for different periods; find the present value of £200 payable for 20 years to commence 10 years hence? What would be the value if the payment were to commence 20 years hence?

years.	£
10	value = 8·110896
20	„ = 15·590326
30	„ = 17·292033
40	„ = 19·792774

(*Civil Service Arithmetical Examination Papers.*)

Present value in first case = £(17·292033 − 8·110896) × 200
= £9·181137 × 200
= £1836·2274
20
s. 4·5480
12
d. 6·576
= £1836 4s. 6·576d. Ans.

Present value in second case $= £(19{\cdot}792774 - 15{\cdot}590326) \times 200$
$= £4{\cdot}202448 \times 200$
$= £840{\cdot}4896$
20
s.9·7928
12
d.9·504
$= £840$ 9s. 9·504d. Ans.

12. ROSE.—A person, having bought goods for £40, sells half of them at a gain of 5 per cent.; for how much must he sell the remainder so as to gain 20 per cent. on the whole? (*Barnard Smith.*)

Total selling price $= £40 + 20\,\%$ of £40
$= £40 + \frac{1}{5}$ of £40
$= £48$;
Selling price of first half $= £20 + 5\,\%$ of £20
$= £20 + \frac{1}{20}$ of £20
$= £21$;
∴ Selling price of remainder $= £48 - £21$
$= £27$. Ans.

General.

1. N. KILMINSTER.—The solution of your query appeared in our issue for November, 1883.

2. O. THOMPSON.—You will find the solution of your query in our issue for March, 1885. For $xy = \pm 1$, or $-\frac{1}{3}$, read $xy = \frac{1}{3}$, or $-\frac{1}{3}$; and for $y = \frac{1}{3x}$, or $\frac{3}{2x}$, read $y = \frac{1}{2x}$, or $-\frac{3}{2x}$.

3. W. G.—In working the question, the result of $(x+y)^8$, viz., $x^8 + 8x^7y + 28x^6y^2 + 56x^5y^3 + 70x^4y^4 + 56x^3y^5 + 28x^2y^6 + 8xy^7 + y^8$, must be given.

4. CORNET.—Your query was solved in our issue for February, 1883.

5. A REGULAR SUBSCRIBER.—The solution of your query appeared in our issue for August, 1882.

6. LACHESIS.—No.

7. STUDENT.—You will find the solution of your query in our issue for November, 1884.

8. HAROLD PAGE.—(1) Your query was solved in our issue for June, 1884. (2) Perhaps 75°/₀. It is rather too thick. (3) Yes.

9. J. H. SLADDIN.—Three posts are placed on the ground so as to form an equilateral triangle, and an elastic ring is stretched round them, the tension of which is 6 lbs.; find the pressure on each post. (*Magnus's* 'Mechanics.')

Pressure on each post $= \sqrt{6^2 + 6^2 + (2 \times 6 \times 6 \times \cos 60°)}$ lbs.
$= \sqrt{72 + (72 \times \frac{1}{2})}$ lbs.
$= \sqrt{72 + 36}$ lbs.
$= \sqrt{108}$ lbs.
$= \sqrt{36} \times 3$ lbs.
$= 6\sqrt{3}$ lbs. Ans.

10. CHARLIE.—Your answer is correct. The income for the second year is greater than that for the third year, as given in the book. The dividend on the investment at 91, viz., £28 10s., has evidently been omitted.

11. READER.—Write the Secretary of the College of Preceptors at 42, Queen's Square, Bloomsbury, for information on the first point, and to the Archbishop's Secretary, Lambeth Palace, S.W., on the second.

12. SAINT GUTHLAC.—No. In regard to Xenophon, such a method would be a great waste of time, the forms of Attic Greek being quite easy to recognise. With regard to Homer, the case is a little different. You would find most of the uncommon words parsed in Anthon's edition. For writers like Livy and Cæsar, no such book published.

13. OWL.—A very good book for your purpose is *Dr. Morris's* 'Lessons in Historical English,' 2s. 6d.; but there are many others.

14. STAFF.—A woman over 18 (see Code, Article 84) for the infants; two pupil teachers and a master. Are you wise to ask what is a suitable salary? That depends on many circumstances which are not known to us.

15. UNIVERSITY.—The degree of Doctor of Literature is granted by the London University, and it is appended to the names of those who have obtained it. At present it is not held by many, being, like the other Doctors' degrees, not easy to get.

16. FOOTBALL.—Large hand too thick and too upright, curves not perfect, 75. Small hand good, but lacking in grace and elegance, 85.

17. THOMAS.—No. 1, large, 76; small, 90. No. 2, large, 80; small, 90. You hold your pen badly, and the edges of the curves are therefore jagged.

18. A. W. V.—(1) Yes. For terms write to the secretary of the college you are going to. Ought you not to have done so long ago? These institutions are not hotels where you can stay at a day's notice. (2) No; prices are high in that neighbourhood. Write to the Young Men's Christian Association, Exeter Hall. You may hear of exactly which is best for you. (3) Usually in July, price, 4s. 6d. Writing: large, 30; text, 40; small, 60. Yes.

19. O. T.—Large hand needs great improvement; get some good copies, 65. Small hand much better, but not good. The letters *m* and *n* are wrongly formed all through, 70.

20. W. R. HYDE.—Study ease and elegance in regard to the small hand; the large needs more practice. You do not hold your pen properly, and the letters are nearly all imperfect. Imitate some good copies.

21. H. C. S.—These two stories do not always appear together (see Hachette's edition), and you are only required to study the one named.

22. DEVONIAN.—You do not say for what purpose or examination you are reading, except in one case. Repeat the other queries. You will find several good books on agriculture advertised; you should get two or three. Among them get Tanner's, published by Macmillan and Co.

23. R. J.—

Kind.	Connective.	Subject.	Predicate	Object.	Extension.
(*a*) Principal		Darkness—Day's great ancestor (appos.)	is vanished		
(*b*) Principal		The glowing morn	hath shed	her silvery light	o'er the darksome canopy (place)
(*c*) Principal		Songs of triumph, songs of praise	pour		now (time) o'er the land (place)
(*d*) Principal cop. co-ord. to (*c*)	and	The music, swelling in the air	preludes	the morning sun	
(*e*) Principal		The trees, fair as Eden's bowers, like silver trees	bathe		in its joyous rays (place)
(*f*) Principal cop. co-ord. to (*e*)	and	The hill-top of the Eastern land, swelling in undaunted majesty	bare	day's sweet restorer, like a crown of gold	forth (place)

Day's—noun, com., sing., neut., poss. case, attributive to 'ancestor.'
great—adj. of quality, pos. degree, attributive to 'ancestor.'
ancestor—noun, com., sing., com. nom. case, in apposition with 'darkness.'
is—auxiliary verb, to 'vanished,' sign of perfect tense.

vanished—past part. of weak intrans. verb.
is vanished—active voice, ind., perf., 3rd., sing., agreeing with 'darkness.'
shed—past part. of strong trans. verb, active voice.
pour—verb, weak trans., act. voice, ind., pres., 3rd., plur., agreeing with 'songs.'
swelling—pres. part. of weak trans. verb, act. voice, qualifying 'music.'
fair—adj. of quality, pos. degree, qualifying 'trees.'
like—adj. of quality, qualifying 'trees,' and governing 'tresses' in the dative.
swelling—pres. part. of weak trans. verb, act. voice, qualifying 'hill-top.'
bare—verb, strong trans., act., ind., past, 3rd., sing., agreeing with 'hill-top.'
forth—adverb of place, modifying 'bare.'
like—adj. of quality, qualifying 'restorer,' and governing 'crown' in dative.

24. NON NULLUS.—The words you quote are best represented by baheeye, consayeeye, agweeye, aheeyerr. This is the sound of the liquid *l* (*l* mouillée, mooeeya). Any good grammar gives you other important information. Large hand, 90; small hand, 95.

25. PIDLEW.—If you send a copy we will criticise it. The passage is too long for insertion; and of no general interest.

26. VYKING.—The full answer is very involved. Read it for yourself in the Code, Article 109, f. viii.

What you want is a good teacher and plenty of practice in drawing *from natural* objects. See the present number of the PRACTICAL TEACHER.

27. D. AND G.—

$$(a+b+c)=0$$
$$\therefore\ (a+b+c)^2=0$$
$$\therefore\ (a+b+c)^2=a^2+b^2+c^2+2ab+2ac+2bc=0$$
$$\therefore\ -(a^2+b^2+c^2)=2(ab+ac+bc)$$
$$\therefore\ a^4+b^4+c^4+2(a^2b^2+a^2c^2+b^2c^2)=4(a^3b^3+a^3c^3+b^3c^3+2a^3bc+2ab^3c+2abc^3)$$
$$\therefore\ a^4+b^4+c^4=2\{a^3b^3+a^3c^3+b^3c^3+2a^3bc+2ab^3c+2abc^3\}+4abc(a+b+c)$$

But $4abc(a+b+c)=0$

$$\therefore\ a^4+b^4+c^4=2(ab+ac+bc)^2$$

Writing: 90 for the large hand, 95 for the small.

Algebra.

1. BICKLEY.—There are three equal vessels A, B, C; the first contains water, the second brandy, and the third brandy and water. If the contents of B and C be put together, it is found that the mixture is 9 times as strong as if the contents of A and C had been put together. Find the ratio of the brandy to the water in the vessel C. (*Hamblin Smith.*)

Let x = quantity of brandy in vessel C,
And " y = " " water " " " ",
Then $x+y$ = " " " " " A,
and " " brandy " " B;

$$\therefore\ \frac{(x+y)+x}{2(x+y)}=9\left\{\frac{x}{2(x+y)}\right\}$$
$$2x+y=9x$$
$$y=9x-2x$$
$$=7x.$$

$\therefore$ Brandy : Water :: 1 : 7.

2. P. M. R.—A regiment has sufficient food for m days; but, if it were reinforced by p men, would have food enough for n days only; find the number of men in the regiment. (*Scholarship*, 1881.)

Let x = No. of men in the regiment;
Then, $mx=n(x+p)$
$$=nx+pn$$
$$mx-nx=pn$$
$$(m-n)x=pn$$
$$\therefore\ x=\frac{pn}{m-n}.$$

$\therefore$ No. of men in the regiment $=\frac{pn}{m-n}$.

3. J. W.—If $x^2=x+1$, then $x^5=5x+3$. (*The Previous, Cambridge.*)

$$x^2=x+1;$$
$$x^3\times x=(x+1)\times x,$$
$$x^3=x^2+x$$
$$=(x+1)+x$$
$$=2x+1;$$
$$x^3\times x=(2x+1)\times x,$$
$$x^4=2x^2+x$$
$$=2(x+1)+x$$
$$=2x+2+x$$
$$=3x+2;$$
$$x^4\times x=(3x+2)\times x$$
$$\therefore\ x^5=3x^2+2x$$
$$=3(x+1)+2x$$
$$=3x+3+2x$$
$$=5x+3.$$

4. BACKWARD.—Find the L.C.M. of:—
(1) x^3-1, x^3+1, x^3-1, and x^6+1;
(2) $x^2+5x+10$, $x^3-19x-30$, $x^3-15x-50$.
(*Todhunter's* 'Algebra for Beginners.')

(1) x^3-1, x^3+1, x^3-1, x^6+1;
$x^3-1=(x+1)(x-1)$,
x^3+1 is divisible by $x+1$,
And x^3-1 " " $x-1$;
$\therefore$ L.C.M. $=(x^3+1)(x^3-1)(x^6+1)$
$=(x^6-1)(x^6+1)$
$=x^{12}-1$. Ans.

(2) $x^2+5x+10$, $x^3-19x-30$, $x^3-15x-50$;
G.C.M. of $x^3-19x-30$ and $x^3-15x-50$,

$x^3-19x-30)x^3-15x-50(1$
$x^3-19x-30$
$4\ |\ 4x-20$
$x-5$

$x-5)x^3-19x-30(x^2+5x+6$
x^3-5x^2
$5x^2-19x-30$
$5x^2-25x$
$6x-30$
$6x-30$

$x-5)x^3-15x-50(x^2+5x+10$
x^3-5x^2
$5x^2-15x-50$
$5x^2-25x$
$10x-50$
$10x-50$

$$x^3-19x-30=(x-5)(x^2+5x+6),$$
$$x^3-15x-50=(x-5)(x^2+5x+10);$$
$$\therefore\ \text{L.C.M.}=(x-5)(x^2+5x+6)(x^2+5x+10)$$
$$=(x^3-19x-30)(x^2+5x+10).\ \text{Ans.}$$

5. CYCLOPS.—Solve the equation:—

$$\frac{\sqrt{1+x}}{1+\sqrt{1+x}}=\frac{\sqrt{1-x}}{1-\sqrt{1-x}}.$$

(*Winchester College Election*, 1882.)

$$\frac{\sqrt{1+x}}{1+\sqrt{1+x}}=\frac{\sqrt{1-x}}{1-\sqrt{1-x}}$$
$$\sqrt{1+x}-\sqrt{(1+x)(1-x)}=\sqrt{1-x}+\sqrt{(1+x)(1-x)}$$
$$\sqrt{1+x}-\sqrt{1-x^2}=\sqrt{1-x}+\sqrt{1-x^2}$$
$$\sqrt{1+x}-\sqrt{1-x}=2\sqrt{1-x^2}$$

Squaring each side $1+x-2\sqrt{1-x^2}+1-x=4(1-x^2)$
$$2-2\sqrt{1-x^2}=4-4x^2$$
$$4x^2-2=2\sqrt{1-x^2}$$
$$2x^2-1=\sqrt{1-x^2}$$
$$4x^4-4x^2+1=1-x^2$$
$$4x^4=4x^2-x^2$$
$$=3x^2$$
$$4x^2=3$$
$$x^2=\tfrac{3}{4}$$
$$\therefore\ x=\pm\frac{\sqrt{3}}{2}.$$

6. JULIUS.—Solve:—

$$(x-a)^3(x+a-2b)=(x-b)^3(x-2a+b).$$

(*Todhunter's* 'Algebra for Beginners.')

$$(x-a)^3(x+a-2b)=(x-b)^3(x-2a+b)$$
$$(x^3-3ax^2+3a^2x-a^3)(x+a-2b)=(x^3-3bx^2+3b^2x-b^3)$$
$$(x+b-2a)$$

$$x^4-2ax^3+2a^3x-a^4-2bx^3+6abx^2-6a^2bx+2a^3b$$
$$=x^4-2bx^3+2b^3x-b^4-2ax^3+6abx^2-6ab^2x+2ab^3$$
$$2a^3x-a^4-6a^2bx+2a^3b=2b^3x-b^4-6ab^2x+2ab^3$$
$$2a^3x-6a^2bx+6ab^2x-2b^3x=a^4-2a^3b+2ab^3-b^4$$
$$2x(a^3-3a^2b+3ab^2-b^3)=a^4-2a^3b+2ab^3-b^4$$
$$2x=a+b$$
$$\therefore\ x=\tfrac{1}{2}(a+b).$$

7. RATIO.—Solve:—

$$\frac{ax+by}{cz}=\frac{cz+ax}{by}=\frac{by+cz}{ax}=x+y+z.$$

(*Tedhunter.*)

$$\frac{ax+by}{cz}=\frac{cz+ax}{by}=\frac{by+cz}{ax},$$

$\therefore$ Each is equal to $\frac{2(ax+by+cz)}{ax+by+cz}$;

If $ax+by+cz$ does not equal 0, we get

$$\left.\begin{aligned} ax+by&=2cz\ (1)\\ cz+ax&=2by\ (2)\\ by+cz&=2ax\ (3)\end{aligned}\right\}$$

Subtracting (2) from (1), $\therefore$ $by=cz$;
" (2) " (3), $\therefore$ $by=ax$;
$\therefore$ $ax=by=cz$, and $x+y+z=2$.

If $ax=by$, then $y=\frac{ax}{b}$,

" $ax=cz$, " $z=\frac{ax}{c}$;

$$\therefore\ x+\frac{ax}{b}+\frac{ax}{c}=x+y+z$$

$$\frac{(bc+ac+ab)x}{bc}=2,$$

$$x=\frac{2bc}{bc+ac+ab},$$

$$\therefore\ ax=\frac{2abc}{ab+ac+bc}.$$

Wherefore, $xa=yb=zc=\frac{2abc}{ab+ac+bc}$.

If $ax+by+cz=0$,

Then, $\frac{ax+by}{cz}=\frac{-cz}{cz}=-1$;

$$\therefore\ x+y+z=-1.$$

8. SOLICITOR.—Show that 144 is a perfect square in any scale, the radix being supposed greater than 4.

Square root of 144 in *any scale* = 12;

$\therefore$ 144 is a perfect square in any scale, the radix being greater than 4.

9. BLACKBIRD.—Prove that the difference of two numbers consisting of the same figures is divisible by 9.

When any number is divided by 9. the remainder is the same as if the sum of the digits of that number were divided by 9.

Let s denote the sum of the digits in either number; then each number is equal to $\frac{s}{9}$ increased by some multiple of 9;

$\therefore$ The difference of the numbers is a multiple of 9.

10. CLEMENS.—What length must a rectangular piece of ground be that shall contain just one acre, and be a mile round it?

Let x = length in yards,
And " y = breadth " ;

Then, (1) $xy=4,840$
(2) $2(x+y)=1,760$
(2) $x+y=880$
$\therefore$ $y=880-x.$

(1) $x(880-x)=4,840$
$880x-x^2=4,840$
$x^2-880x=-4,840$
$x^2-880x+(440)^2=193,600-4,840$
$=188,760$

$x-440=\pm\sqrt{188,760}$
$=\pm 434{\cdot}465\ldots$
$x=440\pm 434{\cdot}465\ldots$
$\therefore$ $x=874{\cdot}465\ldots$, or $5{\cdot}534\ldots$

$\therefore$ Length of ground = 874·465... yards. Ans.

Mensuration.

1. INQUISITIVE.—A cubical block of wood whose edge measures $1\frac{3}{4}$ ft. is split in a direction parallel to one of the faces, the bulk of one portion being 75 per cent. of that of the other. Give the dimensions of the two portions.

Content of block $=(1\frac{3}{4}\text{ ft.})^3$
$=(\frac{7}{4})^3$ cub. ft.
$=\frac{343}{64}$ cub. ft.

1st Portion : 2nd Portion :: 75 : 100,
:: 3 : 4;

$\therefore$ First portion $=\frac{3}{3+4}$ of $\frac{343}{64}$ cub. ft.

$$=\left(\frac{3}{7}\text{ of }\frac{343}{64}\right)\text{ cub. ft.}$$
$=\frac{147}{64}$ cub. ft.
$=2\frac{19}{64}$ cub. ft;

$$\text{Second portion}=\left(\frac{4}{7}\text{ of }\frac{343}{64}\right)\text{ cub. ft.}$$
$=\frac{196}{64}$ cub. ft.
$=3\frac{4}{16}$ cub. ft.

2. ANACOLONTHA.—The ends of a prismoid are rectangles, the corresponding dimensions of which are 18 ft. by 10 ft., and 12 ft. by 16 ft.; the height of the prismoid is 9 ft.; a section is made by a plane parallel to the ends at the distance of 3 ft. from the larger end; show that the section is a square: also find the volumes of the two parts. (*Tedhunter.*)

Dimensions of section $=\{12+\frac{3}{9}\text{ of }(18-12)\}$ ft.
and $\{16-\frac{3}{9}\text{ of }(16-10)\}$ ft.
$=(12+\frac{1}{3}\text{ of }6)$ ft.
and $(16-\frac{1}{3}\text{ of }6)$ ft.
$=(12+2)$ ft. and $(16-2)$ ft.
$=14$ ft. and 14 ft.;

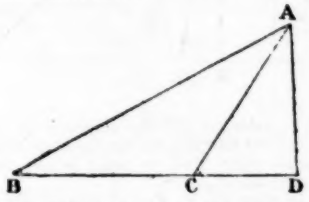
$\therefore$ The section is a square.

Content of larger part $=\left[\left\{[18\times\{(10\times 2)+14\}]+[14\times\{(14\times 2)+10\}]\right\}\times\frac{3}{9}\right]$ cub. ft.
$=\{(18\times 34)+(14\times 38)\}$ cub. ft.
$=(612+532)$ cub. ft.
$=1144$ cub. ft.

Content of smaller part $=\left[\left\{[12\times\{(16\times 2)+14\}]+[14\times\{(14\times 2)+16\}]\right\}\times\frac{3}{9}\right]$ cub. ft.
$=[\{(12\times 46)+(14\times 44)\}\times\frac{1}{3}]$ cub. ft.
$=\{(552+616)\div 2\}$ cub. ft.
$=(1168\div 2)$ cub. ft.
$=584$ cub. ft.

Geometry.

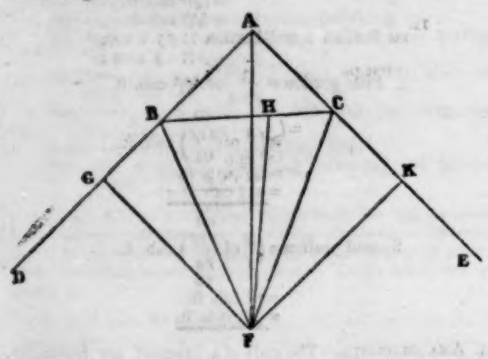
1. J. YOUNG.—If in II. 12 the triangle be isosceles, the square on the side subtending the obtuse angle is equal to twice the rectangle contained by either side, and the straight line made up of that side and the straight line intercepted as in the proposition. (*Scholarship*, 1877.)



Proof.—$BA^2=BC^2+CA^2+2BC.CD$; (II. 12)
But $BC=CA$, (Hyp.)
$\therefore$ $BC^2=CA^2$;
Wherefore, $BA=2BC^2+2BC.CD$
$=2(BC^2+BC.CD)$;
But rectangle $BC.BD=BC^2+$ Rect. $BC.CD$; (II. 3.)
$\therefore$ BA^2 = twice rectangle BC.BD. Q. E. D.

Note.—The solution of the arithmetical query appeared in our issue for May, 1884.

2. BRUCE.—If the two exterior angles at the base of a triangle be bisected, and the bisecting lines produced until they intersect, the line drawn from the point of intersection to the vertical angle will bisect it.



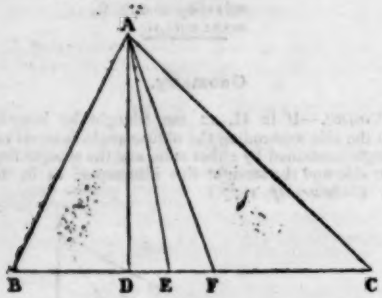
Let ABC be the given triangle, and let the exterior angles CBD, BCE be bisected by the lines BF, CF. Join AF, then AF shall bisect the vertical angle BAC.

From F draw FG perpendicular to AD, FH perpendicular to BC, and FK perpendicular to AE.

Proof.—In the two triangles FGB, FHB,
∠FGB = ∠FHB, (Ax. 11.)
∠FBG = ∠FBH, (Hyp.)
and side FB is common to the two triangles,
∴ Side FG = side FH. (I. 26.)
Similarly it can be proved that FK = FH;
Wherefore FG = FK. (Ax. 1.)
Now, in the two right-angled triangles AGF, AKF,
Side AG = side AK, (I. 47.)
Side AP is common to the two triangles,
and base FG = base FK,
∴ ∠FAG = ∠FAK. (I. 8.)
Wherefore AF bisects the vertical angle BAC.

Q. E. D.

3. HILL.—The angle formed by a perpendicular and a line bisecting the vertical angle of any plane triangle is equal to half the difference of the angles at the base.



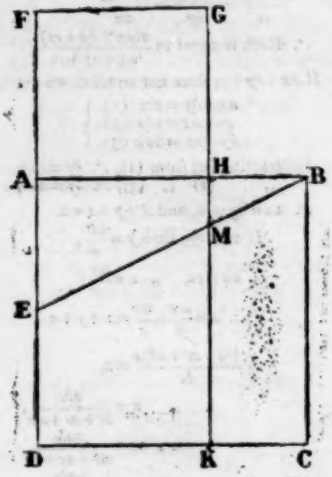
Let ABC be a triangle, AD the perpendicular on the base BC, and AE the line bisecting the vertical angle BAC.

Then the angle DAE shall be equal to half the difference between the angles ABE, ACB.

Draw AF, meeting BC in F, and making the angle EAF equal to the angle EAD. (I. 23.)

Proof.—∠EAC = ∠EAB, (Hyp.)
and ∠EAF = ∠EAD, (Con.)
∴ ∠FAC = ∠DAB; (Ax. 3.)
∠DAC + ∠ACD = a right angle, (I. 32.)
and ½∠BAD + ∠ABD = " " "
∴ ½∠DAC + ∠ACD = ∠BAD + ∠ABD, (Ax. 1.)
But, ∠DAC = ∠DAF + ∠FAC,
∴ ∠DAF + ∠FAC + ∠ACD = ∠BAD + ∠ABD;
But it has been proved that ∠FAC = ∠BAD;
∴ ∠DAF + ∠ACD = ∠ABD; (Ax. 3.)
∴ ∠DAF = difference between angles ABC, ACB;
That is, angle DAE = half the difference between the angles ABC, ACB. Q. E. D.

4. BRUTUS.—In Euclid II. 11, prove that the line EB is divided in the required manner, that is, that EB.BM = EM². (*Cambridge*, 1849.)



By VI. 2,
BM : ME :: BH : HA,
Also, BE : ME :: BA : HA;
∴ By multiplication,
BE.BM : ME² :: BA.BH : HA²;
But AB.BH = AH²,
∴ EB.BM = EM². Q. E. D.

Pupil Teachers' Examination Papers,

WITH ANSWERS.

FIRST YEAR.

Pupil Teachers at end of First Year.

Three hours and a half allowed.

Arithmetic.

MALES.

1. What is the difference between a vulgar and a decimal fraction? How is a vulgar fraction affected by increasing or decreasing the denominator?

A *decimal fraction* has 10, or some power of 10 for its denominator, which is not written but understood, while a *vulgar fraction* may have any number for its denominator, which is always written underneath a line, with the numerator above.

Increasing the denominator decreases the value of the fraction. Decreasing the denominator increases the value of the fraction. The denominator shows into how many parts unity is divided; the less the number of parts, therefore, the greater the value of the parts will be, while the greater the number of parts the less the value of the parts. Hence the answer given.

2. What sum is the same fraction of a sovereign that 7*s.* 4½*d.* is of a guinea; and what is the value of ·513725 of a ton in lbs., qrs., and cwts.?

s. d.

$$\frac{7\ 4\frac{1}{2} \times 20}{21} = \frac{147\text{s. } 6\text{d.}}{21} = 7\text{s. } 0\tfrac{2}{7}\text{d.}$$

·513725 ton.
20
10·274500 cwts.
4
41·0980 qrs.
28
328784
82196
1150·744 lbs.

3. A number of boys were sent to pick up potatoes at the same instant. They placed some in the basket at intervals of 1, 3, 5, 7, 8, 9, 10 and 12, seconds respectively; when will they all be at the basket at the same moment?

Interval to elapse = L.C.M. of 1, 3, 5, 7, 8, 9, 10, 12 secs.

4 | 1, 3, 5, 7, 8, 9, 10, 12
7, 5, 9, 10, 3

$4 \times 7 \times 9 \times 10 = 2520$ sec. = 42 mins. Ans.

4. Reduce $\frac{9}{7\cdot75}$ of $\frac{2\frac{1}{2}}{2\frac{1}{2}}$ of 3·125 of a sovereign to the decimal of £5.

$$\frac{9}{7\cdot75} \text{ of } \frac{2\frac{1}{2}}{2\frac{1}{2}} \text{ of } 3\cdot125\ £ \div 5$$

$$= \frac{9}{1} \times \frac{4}{31} \times \frac{25}{9} \times \frac{2}{5} \times \frac{25}{8} \times \frac{1}{5}$$

$$= \frac{25}{31}$$

= ·806451...Ans.

FEMALES.

1. Find, by practice, the cost of 101 acres 3 roods 15 perches, at £68 10s. per acre.

	£	s.	d.		
2 r. = ½ a.	68	10	0	=	cost of one acre
	101				
	6918	10	0	=	,, 101 acres
1 r. = ½ of 2 r.	34	5	0	=	,, 2 roods
10 p. = ½ r.	17	2	6	=	,, 1 ,,
5 p. = ½ of 10 p.	4	5	7½	=	,, 10 perches
	2	2	9⅜	=	,, 5 ,,
	£6976	5	11½	=	,, 101 a. 3 r. 15 p.

2. A draper sold 5097¼ yards of silk for 1s. 11s. 7d. per doz. yards; how much did he get for it? Find the answer by practice.

	£	s.	d.		
10s. = ½ £	5097	5	0	=	value at £1 p. doz. yds.
1s. = 1/10 of 10s.	2548	12	6	=	,, 10s. ,,
6d. = ½ of 1s.	254	17	3	=	,, 1s. ,,
1d. = ¼ of 6d.	127	8	7½	=	,, 6d. ,,
	21	4	9½	=	,, 1d. ,,
12	£8049	8	1½	=	,, £1 11s. 7d. dz. yds.
	670	15	8⅛		Ans.

3. Make out and receipt the following bill:—

4½ yards calico at 5½d. per yard
6¼ ,, cloth at 18s. 9d. ,,
4 doz. buttons at ¾d. each
12½ doz. reels at 2¼d. each.

Argyle Street,
Glasgow, June 1st, 1885.

Mrs. Simpson.

Bought of Wylie and Lockhead.

4½ yards calico at 5½d. per yard ...	0	2	0⅜
6¼ yards cloth at 18s. 9d. per yard	6	1	10½
4 doz. buttons at ¾d. each ...	0	3	0
12½ doz. reels at 2¼d. each ...	1	11	⅜
	£7	18	2¾

Received same time
£7 18s. 2¾d.
Wylie and Lockhead

4. I spent ⅓ of my money; then ¼ of what remained. I afterwards gave away ⅓ of what I had left, and still there is 10s. left in my purse. What had I at first?

$1 - \frac{1}{3} = \frac{2}{3}$ left.
$\frac{2}{3} - (\frac{1}{4} \text{ of } \frac{2}{3}) = \frac{1}{2}$ of $\frac{2}{3}$ left.
Then $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{2}{3} = 10$s.
$\frac{1}{12} = 10$s.
$\frac{12}{12} = 2$s.
$\frac{12}{12} = 32$s. Ans.

Grammar.

MALES AND FEMALES.

1. '*Go thou*, and bide with him *who* guides
His bark through *lonely* seas,
And as, reclining on his helm,
Sadly he marks the starry realm,
To him thou *mayst bring ease*.'

Analyse the above lines, and parse the words in italics.

ANALYSIS.

Sentence.	Kind of Sentence.	Con.	Subj.	Pred.	Object.	Exten.
(*a*) Go thou	Princ. Sent.		Thou	go		
(*b*) and bide with him	Prin. Sent. co-ord. with (*a*.)	and	[thou]	bide		with him (place)
(*c*) who guides his bark through lonely seas	Adj. Sent. to (*b*)		who	guides	his bark	through lonely seas (place)
(*d*) and thou mayst bring ease to him	Prin. Sent. co-ord. with (*a*) and (*b*)	and	thou	mayst bring	ease (dir.) to him(ind.)	
(*e*) as reclining on his helm he marks the starry realm	Adv. Sent. to (*d*) time	as	he, reclining on his helm	marks	the starry realm	

Go—irreg. intr. verb, act., imp. pres., 2nd, agreeing with *thou*.
thou—pers. pro., masc., sing., 2nd, nom. to *go*.
who—rel. pro., agreeing with antecedent *him*, masc., 3rd, sing., nom. to *guide*.
lonely—adj. of quality, qual. *seas*.
and—cop. conj., joining the two sents. 'Thou bide with him,' and 'Thou mayst bring.'
as—cop. conj., joining the two sents. 'Thou mayst bring,' and 'He marks the starry realm.'
reclining—pres. part. of *to recline*, referring to *he*.
mayst—aux. verb to *bring*, indg. pot. mood, present tense.
bring—irreg. trans. verb, act., inf., pres., gov. by *mayst*.
mayst bring—irreg. trans. verb, act., pot., pres., 2nd, sing., agreeing with its nom. *thou*.
ease—abs. noun, neut., sing., obj., gov. by *mayst bring*.

2. Write a dozen of the common terminations of English adjectives, with two or three words in which each is used.

-ed, as wretched, mottled, long-tailed.
-en, as golden, wooden, oaken.
-ern, as northern, southern, eastern.
-fast, as steadfast, rootfast.
-fold, as fourfold, twofold, manifold.
-ful, as sinful, hateful, needful.
-ish, as whitish, blackish, churlish.
-less, as houseless, fearless, homeless.
-like, as godlike, homelike, childlike.
-some, as gladsome, winsome, wholesome.
-ty, as twenty, thirty, forty.
-ward, as heavenward, homeward, forward.

3. What is the force of the affixes in the following words:—Drunkard, witchcraft, lambkin, beadle, hillock, brewery, punster.

Affix.	*Meaning.*
-ard,	agent or doer (augmentative).
-craft,	skill, art.
-kin,	diminutive.

-le, agent.
-ock, diminutive.
-ery, place.
-ster, agent.

Geography.

1. Draw a map of one of the following:

(1) Ireland.
(2) England, south of the Basin of the Trent.
(3) The Dominion of Canada.

2. What are the chief characteristics of the Dominion of Canada?

The greater part of the Dominion of Canada has a flat surface with a gentle slope towards the Arctic Ocean. The mountains are in the West, and are a continuation of the chain which stretches the whole length of the continent, Mt. Brown and Mt. Elias being the highest peaks. A slightly rising ground separates the basin of the St. Lawrence, the greatest river of the country, from the north plain. In the basin of the St. Lawrence there is a series of freshwater lakes, the most extensive in the world (Superior, Huron, Michigan, Erie, and Ontario), while in the north there are others of great size, including Lake Winnipeg, Great Bear Lake, Great Slave Lake, Athabasca, etc. Having no protection from the cold blasts from the Arctic Ocean, Canada is very cold in winter, but warmer in summer than the continent of Europe in the same latitude. It has in the south, large forests, a fertile soil, and abundance of minerals, the produce of the forests, the soil, and the mines, being the chief sources of the wealth of the country.

3. Where are the chief coal and iron districts of the British Islands? To what countries do we send a large part of the produce of our mines?

Coal and iron are found in close proximity to each other. The chief coalfields of England are:—The Northumberland and Durham, South Lancashire, South Wales, South Staffordshire, York, Derby, and Nottingham, Cumberland, North Staffordshire, Flint, Leicestershire, Forest of Dean, North Lancashire. On most of these iron is found, and especially in South Staffordshire, West Durham, and Cleveland.

In Scotland, the coalfields are in the basins of the Firth and Clyde, the richest being in the neighbourhood of Glasgow. Iron is found in the same districts.

In Ireland, the Kilkenny coalfield is the best, but coal is not abundant. From this cause iron, which is widely diffused, is little wrought.

Iron in its manufactured state is sent to almost every part of the world. Coal is sent to the Baltic, the Mediterranean, and the coaling stations of the British navy and mercantile stations.

History.

1. What were the principal divisions of England under the Roman and Saxon kingdoms? Say, if you can, who founded the latter?

Britain, under the Romans, was divided into six provinces, as follows:—

I. *Britannia Prima*, the country south of the Thames basin.
II. *Flavia Cæsariensis*, the central counties north of the Thames, east of the Severn, and from the Wash to the Dee.
III. *Britannia Secunda*, Wales and all England west of the Severn and Dee.
IV. *Maxima Cæsariensis*, north of II., to the Tyne and Solway.
V. *Valentia*, north of IV., to the Firths of Forth and Clyde.
VI. *Caledonia*, north of V.

Under the Saxons, the country was divided into eight kingdoms, afterwards reduced to seven, then gradually to three, and lastly united into one under Egbert. They originally were:—

(1) *Kent*, founded by Hengist, A.D. 457.
(2) *South Saxony*, Ella, A.D. 490.
(3) *West Saxony*, or *Wessex*, Cedric, A.D. 495.
(4) *East Saxony*, or *Essex*, Ercenwin, A.D. 527.
(5) and (6) *Deira*, Ella, and *Bernicia*, Ida, A.D. 547, united as *Northumbria* in A.D. 617.
(7) *East Anglia*, Uffa, A.D. 575.
(8) *Mercia*, Penda, A.D. 626.

2. What was the Saxon Parliament called? who were members of it, and what were its powers?

The Anglo-Saxon Parliament was called the Witenagemot or Witan. To it were called all the princes of the tribes, the ealdormen, the abbots and bishops, and the largest landholders, by the king. It framed laws, advised the king, assisted in making treaties, and decided upon the succession to the throne.

3. What circumstances led to the Norman invasion of England?

Edward the Confessor had spent twenty-seven years in France before he became king of England. His sympathies and habits were those of the French. Consequently, the friends of his youth obtained places of trust and profit under the crown; the French language was spoken at the court. The English were displeased, and revolted. Godwin, Earl of Kent, refused to punish the burghers of Kent for an attack on the retainers of Eustace, a Norman count, and chose rather to revolt. As soon as this happened, Edward applied to William of Normandy for help, but, before he arrived, the revolt had ended. He saw, however, Norman garrisons in many towns, heard French spoken, and during his stay, is said to have gained Edward's promise to name him as his successor. Afterwards, Harold fell into the power of William, and, under threats, was prevailed upon to consent to aid him in obtaining the throne. When Edward died, William claimed the fulfilment of these pledges, and invaded the country.

Composition.

Write the substance of the following passage in your own words:—

The family of Dudley, in Northamptonshire, bears for a crest a woman's head with a helmet, her hair dishevelled, and her throat-latch loose. The origin of this crest was singular. In the year 1390, Hotot, having a dispute with a man called Ringsdale, about the title to a piece of land, challenged the latter to a duel. On the day appointed, however, Hotot was ill. Rather than he should suffer in his honour, or lose his land, his daughter, Agnes, armed herself, mounted her father's horse, and met Ringsdale at the time appointed. After a stubborn fight she dismounted him, and when he was on the ground, she loosened her throat-latch, let down her tresses, and discovered her sex. On marrying into the Dudley family afterwards, they adopted this crest in honour of her heroic conduct.

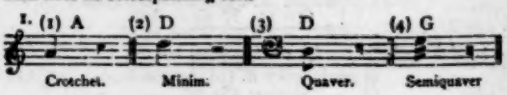
Music.

OLD NOTATION.

A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.

1. Write above each of the following notes its pitch-name (C, D, &c.), and below each write its value-name. Place by each note its corresponding rest.



2. Add proper time-signatures to the following:—

3. Write below each of the following intervals its name (major 6th, &c.):—

TONIC SOL-FA NOTATION.

1. Re-write the following, doubling the value of every note:—

|m :s.f |m :s |d' :t.l |s :— |

1. |m :—|s :f |m :—|s :—|d' :—|t :l |s :—|—:—|

2. What is meant by "Key A" at the beginning of a tune?

2. That the particular sound "A" obtained from a tuning-fork is to be the tonic or *doh* of the music to which "Key A" is prefixed.

3. Write the names of the following intervals:—(1) *fah* to *te*; (2) *me* to *lah*; (3) *te*, to *doh*; (4) *soh* to *te*.

3. (1) Pluperfect 4th or tritone; (2) perfect 4th; (3) minor 2nd; (4) major 3rd.

SECOND YEAR.

Pupil Teachers at end of Second Year.

FIRST PAPER.

Three hours and a half allowed.

Euclid.

MALES.

1. Any two sides of a triangle are together greater than the third side.

When is this proposition first used by Euclid?

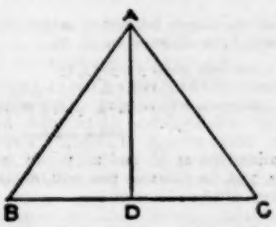
Euclid, Book I., Prop. 20.

In the succeeding proposition, 21.

2. If two triangles have two angles of the one equal to two angles of the other, and one side equal to one side, viz., the sides opposite to equal angles in each, then shall the other sides be equal, each to each, and also the third angle of the one equal to the third angle of the other.

Euclid, Book I., Prop. 26, second part.

3. ABC is a triangle, and D any point in the base; show that ABC and ACB are together less than two right angles.



Because ACD is a △, and the side CD is produced to D, the exterior ∠ ADB is greater than the interior and opposite ∠ ACD (I., 16).

∵ ABD is a △, and the side BD is produced to C, ∴ ∠ ADC is greater than the ∠ ABD (I., 16).

∴ the two ∠'s ADC, ADB are greater than the two ∠'s ABC, ACB.

But the two ∠'s ADC, ADB are together equal to two right ∠'s (I., 13).

∴ the two ∠'s ABC, ACB are together less than two right ∠'s. Q. E. D.

Arithmetic.

FEMALES.

1. Add together $\frac{1\frac{1}{2}}{2\frac{1}{4}}$ of 4s. 6d., $2\frac{7}{10}$ of 1s., and $\frac{1\frac{1}{2}}{1\frac{1}{4}}$ of £1, and reduce the result to the fraction of three half-crowns.

$$\left(\frac{1\frac{1}{2}}{2\frac{1}{4}} \text{ of 4s. 6d.} + 2\tfrac{7}{10}\text{s.} + \tfrac{1\frac{1}{2}}{1\frac{1}{4}}\text{£}\right) \div 7\text{s. 6d.}$$
$$= (\tfrac{2}{3}\times\tfrac{9}{2} + 2\tfrac{7}{10} + \tfrac{1\frac{1}{2}}{1\frac{1}{4}}\times\tfrac{20}{1}) \div \tfrac{15}{2}$$
$$= (3 + 2\tfrac{7}{10} + 4\tfrac{2}{5}) \times \tfrac{2}{15}$$
$$= 10\tfrac{1}{10} \times \tfrac{2}{15}$$
$$= \tfrac{101}{10} \times \tfrac{2}{15}$$
$$= \underline{\tfrac{101}{75}}. \text{ Ans.}$$

2. In carrying a basket containing $\frac{4}{9}$ of a bushel of peas from one place to another, $\frac{3}{11}$ of a peck were spilt; how many remained in the basket?

$$\tfrac{4}{9} \text{ bush.} - \tfrac{3}{11} \text{ peck.}$$
$$= \frac{5\times4}{9} - \tfrac{3}{11}$$
$$= \frac{220-18}{99}$$
$$= \tfrac{202}{99} \text{ pks.}$$
$$= \underline{2\tfrac{4}{99} \text{ pks.}} \text{ Ans.}$$

3. If the owner of $\frac{3}{8}$ of a ship sell $\frac{4}{5}$ of $\frac{1}{12}$ of his share for £17½, what is the value of $\frac{3}{8}$ of $\frac{1}{2}$ of it?

Amt. sold $= \frac{3}{8}\times\frac{4}{5}\times\frac{1}{12} = \frac{3}{120}$.

$\frac{3}{120}$ of $\frac{1}{2} = \frac{3}{240}$

$\frac{3}{240} : \frac{3}{8} :: £17\frac{1}{2}$

$= \frac{8}{240}\times\frac{35}{2}$

$= \underline{£1\ 8\text{s. } 0\tfrac{8}{24}\text{d.}}$ Ans.

4. What are the decimal fractions equal to $\frac{7\frac{1}{2}}{9}$ and $\frac{3\frac{1}{2}}{5}$?

$$\frac{7\frac{1}{2}}{9} = \frac{7{\cdot}5}{9} = {\cdot}8\dot{3}. \text{ Ans.}$$
$$\frac{3\frac{1}{2}}{5} = \frac{6\frac{1}{2}}{10} = \frac{6{\cdot}5}{10} = \underline{{\cdot}65}. \text{ Ans.}$$

Grammar.

MALES AND FEMALES.

1.

'*How*, in the noon of night *that* pibroch thrills,
Savage and shrill! But with the breath *which* fills
Their mountain pipe, *so* fill the mountaineers
With the fierce, native *daring* which instils
The *stirring* memory of *a thousand* years,
And Evan's, *Donald's fame* rings in *each* clansman's ears.

Paraphrase the above passage, analyse it, and parse the words in italics.

How wild and thrilling is the sound of the bagpipe, as it breaks the stillness of the midnight! But the courage of the Highlanders rises as the music waxes louder and stronger, and brings back to their memories the brave deeds of their ancestors, in the centuries which have passed. Again they seem to have told to them the exploits of Evan and Donald, the leaders of their clan of old.

ANALYSIS.

Sentence.	Kind of Sent.	Connective.	Subject.	Predicate.	Object.	Extension.
(*a*) How in the noon of night that pibroch thrills savage and shrill	Prin. Sent.		That pibroch	thrills		how savage and shrill (man.) the noon of night. (time)
(*b*) but with the breath so fill the mountaineers with the fierce native daring	Prin. Sent.	but	the mountaineers	fill		with the breath (time) so (man) with the fierce native daring
(*c*) which fills their mountain pipe	Adj. Sent. to *breath* in (*b*)		which	fills	their mountain pipe	
(*d*) which instils the stirring memory of a thousand years	Adj. Sent. to *daring* in (*b*)		which	instils	the stirring memory of a thousand years	
(*e*) and Evan's, Donald's fame rings in each clansman's ears	Prin. Sent. cop. to (*b*)	and	Evan's Donald's fame	rings		in each clansman's ears (place)

How—adv. of degree, qual. *savage*.
that—dist. adj., qual. *pibroch*.
savage—adv. of manner, qualg. *thrills*.
which—rel. pro., agreeing with antecedent *pibroch*, neut., sing., 3rd, nom. to *instils*.
so—adv. of manner, qualg. *fills*.
daring—abs. noun, neut., sing., 3rd, obj., gov. by *with*.
stirring—partl. adj. of quality, qualg. *memory*.
a—dist. adj., limiting *thousand*.
thousand—adj. used as noun, neut., sing., 3rd, obj., gov. by *of*.
or, a limiting *thousand years* (=period).
Donald's—prop. noun, masc., sing., poss., gov. by *fame*.
fame—abs. noun, neut., sing., nom. to *rings*.
each—dist. numl. adj., qualg. *clansman*.

2. Write words, and their meanings, to show the different forms of the prefix *con*.

con, con-nect, to bind together.
co, co-operate, to work together.
col, col-locate, to place together.
com, com-pound, to mix together.
cor, cor-rect, to put right.
coun, coun-tenance, that which holds together (the face as holding the feelings).

3. What English suffixes are used to make diminutives? Give examples of their use.

-en, chicken, kitten.
-ing, farthing, tithing.
-ling, darling, gosling.
-kin, lambkin, mannikin.
-rel, cockerel, wastrel.
-y, *-ie*, as lady, laddie, lassie.

Geography.

1. Draw a map of one of the following :—

(*a*) The Mediterranean Sea.
(*b*) Spain and Portugal.
(*c*) Austria.

2. What are the following noted for, and where are they situated?—Belgrade, Trieste, Nijni-Novgorod, Lyons, Calcutta, Coimbatore, Surat, Ladoga, Maladetta, Weser, Patna, Simplon.

Belgrade, capital of Servia, strongly fortified ; at the junction of the Danube and the Save.

Trieste, the chief port of Austria, on the Gulf of Trieste, at the N.E. extremity of the Adriatic ; considerable commerce.

Nijni-Novgorod, a yearly fair, lasting several months ; at the junction of the Oka with the Volga, near the centre of Russia.

Lyons, next to Paris the most important city of France ; extensive manufactures of silk ; at the confluence of the Rhone and the Saone.

Calcutta, the capital of British India, residence of the Viceroy; great trade ; on the river Hooghly, one of the branches of the mouth of the Ganges.

Coimbatore, a great gap or opening south of the Ghauts in S. India. Also the name of a province of Madras, having a capital of the same name.

Surat, near the mouth of the Tapty, in the Gulf of Cambay, noted for its export of cotton and grain.

Ladoga, the largest of the great fresh-water lakes of N.W. Russia, 120 miles long by 70 broad.

Maladetta, the highest mountain of the Pyrenees (11,700 ft.), between France and Spain.

Weser, a river of Germany, flowing N.W. into the German Ocean, 250 miles long.

Patna, a large city of India, situated on the S. bank of the Ganges, is the capital of a province of Bengal, noted for its growth and export of rice and wheat.

Simplon, a mountain of Switzerland, between Valais and Piedmont ; over it Napoleon I. constructed a pass, 6,600 feet high.

3. Write a short account of the acquisition of British India.

The first British settlement in India was formed at Surat in 1612, and was followed at intervals by those of Fort St. George (Madras), Bombay, and Fort William (Calcutta). In 1745 the English and French took opposite sides in the quarrels of native princes, the result being the destruction of French power and the ascendancy of the English. The overthrow of Surajah Dowlah in 1757 led to the acquisition of Bengal, Behar, and Orissa. Immediately afterwards, Burdwan and Chittagong were added, and under the Governor-generalship of Lord Cornwallis, Marquis of Wellesley, Marquis of Hastings, Earl Amherst, Lord Ellenborough, Harding, and Dalhousie, more than three-fourths of the country has been subjugated, and the rest made dependent and tributary, with the exception of Nepaul and Bhotan in the N. near the Himalayas.

SECOND PAPER.

Two hours and a half allowed.

Needlework.

FEMALES.

The needlework specimens will be collected by the Inspector at the expiration of one hour after the distribution of the examination paper.

Arithmetic.

MALES.

1. What is the insurance on £6000 at 3 per cent. if I so insure as to save the premium as well as the property in case of loss?

For every £100 received in case of loss £3 would have been paid as premium.

$\therefore$ £3 insures £97, and the premium will be
$£6000 \times \frac{3}{97} = £\frac{18000}{97} = £185\frac{55}{97}$. Ans.

2. A man invests £585 in Turkish 5 per cents. at 97½, and also buys £700 stock in 3 per cent. consols at 94½. What is his yearly income, and how much stock has he standing in his name?

$$\text{Stock in 5 per cents.} = \frac{585 \times 100}{97\frac{1}{2}} = £600$$
$$\text{,, 3 ,,} = £700$$
$$\text{Total stock in his name} = £1300$$
$$\text{Income from first investment} = \frac{600 \times 5}{100} = £30$$
$$\text{,, ,, second ,,} = \frac{700 \times 3}{100} = £21$$
$$\text{Total income} = £51$$

3. Find the sum the simple interest of which for 3 years at 5 per cent. shall exceed the discount by 1s. 3d.

£100 will yield $3 \times 5 = £15$
The discount will be $£115 : £100 :: £15 : £\frac{300}{23}$
The difference will be $£15 - £\frac{300}{23} = £\frac{45}{23}$
$\therefore £\frac{45}{23} : £\frac{1}{16} :: £100 : £3\ 3s.\ 10\frac{1}{2}d.$ Ans.

4. A grocer mixes tea at 3s. and 2s. per lb., and by selling the mixture at 2s. 7½d. he gains 20 per cent. on every lb. sold : in what proportions did he mix them?

The cost price of the mixture will be 120 : 100 : s. d. 2 7 : s. d. 2 2½

For 9 farthings gained on 2s. tea 39 are lost on 3s. tea. Therefore the proportion of mixture will be

9 : 39
or 3 : 13. Ans.

History.

MALES AND FEMALES.

1. Write a short summary of the events of the reign of King John.

King John reigned from 1199 to 1216 A.D. Arthur, John's nephew, the real heir to the throne, was imprisoned and murdered (1202). Resenting his death, Philip of France attacked and conquered nearly all John's possessions in France (1204). John having refused to acknowledge Stephen Langton as Archbishop (1207) the kingdom was laid under an interdict (1207), and the Pope excommunicated the King in the following year. The people, smarting under this infliction, were on the verge of rebellion, and John was compelled to submit to Pandulph, the Pope's legate. The Barons, unable longer to endure the tyranny and bad government of John, compelled him to sign the Magna Charta at Runnymede (1215). John refused to be bound by this charter, and rose in rebellion, offering the

Crown to Louis of France while the quarrel was being decided. John was overtaken in the Wash, and died at Newark Castle (1216).

2. Who were the Ordainers, Lollards, Bretwaldas, Jutes, and Danes, and what were the Star Chamber, Statute of Mortmain, and the Statute of Six Articles.

Ordainers.—A committee of the House of Commons, set to reform the household and government of Edward II.

Lollards.—The followers of John Wycliffe, the earliest Reformer of the Church.

Bretwaldas.—The Saxon kings who obtained the greatest amount of power during the Heptarchy.

Jutes.—The earliest inhabitants from the west of Europe who invaded Britain. They came from the district of the Elbe.

Danes.—Norsemen from Norway, Sweden, and Denmark, who ravaged England in the eighth and ninth centuries.

Star Chamber.—A court established in the early part of the Tudor Period, which tried offences against the Crown, refusal to obey proclamations, riot, conspiracy, etc.

Statute of Mortmain.—A statute which declared all lands given to the Church without the consent of the Crown to be forfeited.

Statute of Six Articles.—A statute containing Henry VIII.'s belief, and enjoining transubstantiation, the celibacy of the clergy, communion in one kind, vows of chastity, private masses, and auricular confession.

3. What events would you assign to the following dates:—1190, 1208, 1264, 1333, 1381, 1450, 1455, 1485, 1536, 1558?

1190 Richard Cœur de Lion joined the Crusade.
1208 England laid under an interdict.
1264 Henry refused to abide by the provisions of Oxford. Battle of Lewes.
1333 War with Scotland. Battle of Halidon Hill.
1381 Wat Tyler's rebellion.
1450 Jack Cade's rebellion.
1455 Commencement of the Wars of the Roses (St. Alban's).
1485 Battle of Bosworth Field.
1536 'Pilgrimage of Grace' on the suppression of the monasteries.
1558 Death of Mary. Loss of Calais.

Teaching.

What directions would you give to a Third Standard before beginning to write the word 'Geography' in large hand? What use would you make of the blackboard?

In a writing lesson the blackboard should be used to set copies for imitation, and to point out errors and the way to remedy them. In such a word as Geography the mistakes apt to be made are in the lengths of heights of the letters above the line, and also in the method of joining the letters.

Rule the blackboard with lines at the correct distance for the small letters: call this a 'height.' Rule a height *above* and *below* the space for small letters. Subdivide these heights by thinner lines. Write the copy.

Then the directions to be given would be to see that *G* and *h* were a height above the small letters—*p* only half a height—and that *G*, *g*, *p*, and *y* were each a height below the small letters; that all curves were properly made, the strokes of *g*, *a*, and *y* joined to the curves, and the *o* and *e* in *a* properly made from the right side.

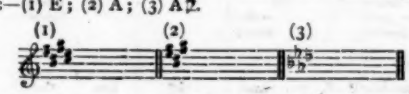
Music.

OLD NOTATION.

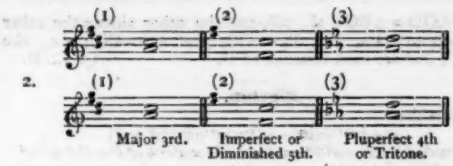
A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

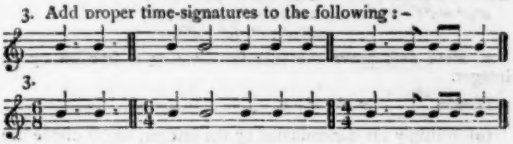
1. Write the key-signatures of each of the following major keys:—(1) E; (2) A; (3) A♭.

1. 

2. Write below each of the following intervals its name (minor 2nd, &c.):—



3. Add proper time-signatures to the following:—



TONIC SOL-FA NOTATION.

1. What is the mental effect of (1) *fah*; (2) *te*; (3) *soh*?

1. (1) Desolate or awe-inspiring; (2) expectant, piercing; (3) bold, bright, grand.

2. Write the names of the following intervals:—(1) *soh* to *te*; (2) *te*, to *fah*; (3) *fah* to *te*.

2. (1) Major 3rd; (2) imperfect 5th; (3) pluperfect 4th or tritone.

3. Write (1) a six-pulse measure; (2) a nine-pulse measure:—

3. (1) | : : | : : ‖

(2) | : : | : : | : : ‖

THIRD YEAR.

Pupil Teachers at end of Third Year.

FIRST PAPER.

Three hours and a half allowed.

Euclid.

MALES.

(All generally understood abbreviations for words may be used, but not symbols of operation, such as +, −, ×.)

1. If one side of a triangle be produced, the exterior angle is equal to the two interior and opposite angles.

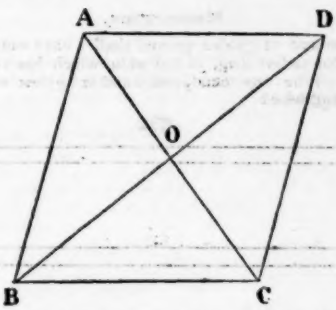
Euclid, Book I., Prop. 32.

2. To describe a square upon a given finite straight line.

Euclid, Book I., Prop. 46.

3. Prove that every parallelogram is bisected by its diameter, and that the diagonals or diameters of a parallelogram bisect each other.

Let ABCD be a parallelogram, of which AC, BD are the diagonals or diameters. AC bisects the parallelogram, and AC, BD bisect each other.



For AD = BC and DC = AB and the ∠ ADC = ∠ ABC (I. 34).
∴ △ ADC = △ ABC (I. 4).
Again AC and BD bisect each other.
For ∠ ADB = ∠ DBC and ∠ DAC = ∠ BCA (I. 29), and the side AD = side BC (I. 34).

$\therefore$ $\triangle AOD = \triangle BOC$ (I. 26), and the other sides = the other sides each to each, viz., BO = DO, and AO = CO; *i.e.*, the lines AC, BD are each bisected in O. Q. E. D.

Algebra.

1. Show that

$$(ac+bd)^2+(ad-bc)^2=(a^2+b^2)(c^2+d^2)$$
$$=a^2c^2+2abcd+b^2d^2+a^2d^2-2abcd+b^2c^2=a^2c^2+a^2d^2+b^2c^2+b^2d^2$$
$$=a^2c^2+a^2d^2+b^2c^2+b^2d^2=a^2c^2+a^2d^2+b^2c^2+b^2d^2$$
$$a^2(c^2+d^2)+b^2(c^2+d^2)=a^2(c^2+d^2)+b^2(c^2+d^2)$$
$$=(a^2+b^2)(c^2+d^2).$$

2. State and prove the rule for dividing a fraction by an integer.

Divide $\frac{x^6-1}{x^3+1}$ by x^2-x+1

(*a*) Multiply the denominator by the integer, or (*b*) divide the numerator by the integer.

Let $\frac{a}{b}$ be any fraction and x any integer, then $\frac{a}{b} \div x$ will be $\frac{a}{bx}$. For $\frac{a}{b}$ denotes that a is divided into b parts and $bx = b$ times x, *i.e.*, that b is increased x times. $\therefore$ $\frac{a}{bx}$ is $\frac{1}{x}$th part of $\frac{a}{b}$

The second part of the rule may be demonstrated thus:

Let $\frac{ax}{b}$ be any fraction and x any integer.

Then $\frac{ax}{b} \div x$ will be $\frac{a}{b}$. For $\frac{ax}{b}$ is x times $\frac{a}{b}$ parts, $\therefore$ $\frac{a}{b}$ is $\frac{1}{x}$th part of $\frac{ax}{b}$.

$$\frac{x^6-1}{x^3+1} \div x^2-x+1$$
$$=\frac{(x^3+1)(x^3-1)}{x^3+1} \times \frac{1}{x^2-x+1}$$
$$=\frac{(x^3-1)(x+1)(x^2-x+1)}{(x^3+1)(x^2-x+1)}$$
$$=\underline{\frac{(x^3-1)(x+1)}{x^3+1}}. \text{ Ans.}$$

3. Solve the equations—

(*a*) $\frac{x}{a}-\frac{dx}{c}+3ab=1.$

(*b*) $\frac{1}{2}(x+6)-\frac{x}{3}=x-\frac{5}{3}+\frac{1}{6}(x-8).$

(*a*) $\frac{x}{a}-\frac{dx}{c}+3ab=1$

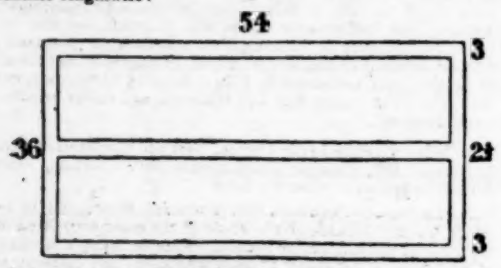
$$cx-adx+3a^2bc=ac$$
$$x(c-ad)=ac-3a^2bc$$
$$x=\underline{\frac{ac(1-3ab)}{c-ad}}. \text{ Ans.}$$

(*b*) $\frac{1}{2}(x+6)-\frac{x}{3}=x-\frac{5}{3}+\frac{1}{6}(x-8)$

$$3(x+6)-2x=6x-10+x-8$$
$$3x-2x-6x-x=-8-10-18$$
$$6x=36$$
$$x=\underline{6}. \text{ Ans.}$$

Mensuration.

What amount of garden ground shall I have out of a rectangular plot 54 feet long, 36 feet wide, which has a footpath 3 feet wide all the way round, and another 2½ feet wide up the middle lengthwise?



$54-3-3=48$ feet
$36-3-3-2\frac{1}{2}=27\frac{1}{2}$ feet

Area $=48\times27\frac{1}{2}$
$=1320$ feet
$=\underline{146\frac{2}{3}}$ yards.

Arithmetic.

FEMALES.

1. Which is the greater, ⅓ of 3·25, or ¼ of 9½, and by how much?

$\frac{1}{3}\times3{\cdot}25, \frac{1}{4}\times9\frac{1}{2}$
$=\frac{1}{3}\times\frac{13}{4}, \frac{1}{4}\times\frac{19}{2}$
$=1\frac{1}{4}, 1\frac{3}{4}$
$=\frac{39, 38}{36}$
$\therefore$ $\frac{1}{3}$ of 3·25 is greater by $\frac{1}{36}$ or ·27̇.

2. Divide 1·11 by ·0037, and subtract ·142857 of a guinea from £5, and reduce the result to the decimal of a guinea.

$\frac{1{\cdot}11}{{\cdot}0037}=\frac{11100}{37}=\underline{300}$. Ans.

£5 − 142857 of 21s.
$=100-\frac{1}{7}$ of 21s.
$=$ 97s.
97s. to dec. of 1 guinea
$=\frac{97}{20}$
$=\underline{4{\cdot}85}$. Ans.

3. If A has ⅔ of what B has, who has $\frac{4}{11}$ of what C has, who has $\frac{5}{11}$ of what D has, what fraction of A's is D's share?

A's share is ⅔ of $\frac{4}{11}$ of $\frac{5}{11}$ of D's
$=\frac{40}{363}$ of D's
D's share is $\therefore$ $\underline{\frac{363}{40}}$ of A's. Ans.

4. Reduce ·6 of £1 + ·6 of 5s. 3d. + 3·75 of a crown to the decimal of 16s.

·6£ + ·6 of 5s. 3d. + 3·75 of 5s. ÷ 16s.
$=\frac{6}{10}\times20+\frac{6}{10}\times63\text{d.}+3\frac{3}{4}\times5\text{s.}\div16\text{s.}$
$=12\text{s.}+3\frac{3}{4}\text{s.}+18\frac{3}{4}\text{s.}\div16$
$=\frac{34\frac{1}{2}}{16}$
$=\frac{34{\cdot}25}{16}$
$=\underline{2{\cdot}140625}$. Ans.

Grammar.

MALES AND FEMALES.

1. '*But now* at noon
Upon the southern side of the slant hills,
And where the woods fence *off* the northern blast,
The season smiles, *resigning all* its rage,
And has the warmth of May. The vault is *blue*
Without a cloud, and white without a speck
The dazz'ling *splendour* of the scene below.'

Paraphrase the above passage; analyse the lines from 'But' to 'May'; parse the words in italics.

On the side of the hill which slopes toward the south, and which is sheltered by the trees from the biting north wind, on a winter's day at noon the power of the sun is such that the season seems to have lost all its rigour, and the weather is as bright as that of May. There is not a cloud to darken the blue sky, nor a speck of dirt to dim the whiteness of the snow-covered earth.

Sentence.	Kind of Sent.	Connective.	Subj.	Predicate.	Object.	Extension.
(*a*) But now at noon upon the southern side of the slant hill the season smiles resigning all its rage,	P. S. advers. to preceding sent.	but	the season resigning all its rage	smiles		now at noon (time) upon the southern side of the slant hill (place)
(*b*) And where the woods fence off the northern blasts,	adv. to *a*	and [*it smiles*] where	the woods	fence	the northern blasts	off
(*c*) And has the warmth of May.	P. S. coord. with *a*	and	[it]	has	the warmth of May	

But—disj. conj., connecting the sent., 'The season smiles to a preceding sent.
now—adv. of time, qual. *smiles*.
and—cop. conj., joining the sent. 'The season smiles upon the southern side,' to the sent. 'It smiles.'
where—advl. conj., joining the sent, 'The season smiles' to 'the woods fence off.'
off—adv. of manner, qual. *fence*.
resigning—pres. part. of *to resign*, ref. to *season*.
all—adj. of quantity, qual. *rage*.
blue—adj. of quality, qual. *vault*.
splendour—abs. noun, neut., sing., nom. to *is* und.

2. Pick out the Latin words from the above passage.

Season, resigning, rage, vault, splendour, scene.

3. What are the affixes in the following words? Give their meanings and other words with the same affix:—Vacate, audit, mechanician, chasm, junior, fluent.

-ate	to make	hesitate, imitate
-it	to make	credit, edit, debit
-cian	agent	physician, rhetorician
-sm	abstract idea	pleonasm
-ior	degree	inferior, superior
-ent	quality	dependent

Geography.

1. Draw a map of one of the following:—

(*a*) Africa south of the equator.
(*b*) The basin of the Ganges.
(*c*) Afghanistan and Beloochistan.

2. What do you know of the currents of the Indian Ocean?

The area of the Indian Ocean being less than that of either of the others, its currents are less marked. The Equatorial Current sets westward towards the coast of Africa, and is divided into two branches by the island of Madagascar. They again join, and form the Cape Current. This is again divided, one half flowing into the Atlantic, and the other turned back by the Agulhas bank, forms the counter-current of the Indian Ocean, of importance, as being in the direct route of vessels from the Cape to Australia. North of the Equatorial Current there are only surface currents, caused by the changes of the monsoons.

3. Account for the dryness of the Desert of Gobi, and name the other deserts and plains of Asia.

The Desert of Gobi is bounded north and south by lofty mountains. In whichever direction the wind blows, it is deprived of its moisture before it crosses the desert, consequently the desert gets no rain.
The other great wastes are the Steppes of Khirgis, Ishim, and Baraba, parts of the great Siberian plain, the deserts of Arabia and Syria.
The China Plain, Plains of the Ganges, Indus, Euphrates and Tigris, are fertile in many parts, especially the China Plain.

SECOND PAPER.

Two hours and a half allowed.

Needlework.

FEMALES.

(The Needlework Specimens will be collected by the Inspector at the expiration of one hour after the distribution of the Examination Paper.)

Arithmetic.

MALES.

1. What number multiplied by itself will produce 6407·522209?

$$\begin{array}{r} 64'07'52'22'09\,(80{\cdot}047. \text{ Ans.} \\ 64 \\ \hline 16004)\ 75222 \\ \quad 64016 \\ \hline 160087)\ 1120609 \\ \quad 1120609 \\ \hline \end{array}$$

2. A person finds that if he invests a certain sum in railway shares, paying £6 per share when the £100 share is at £132, he will obtain £10 16s. a year more for his money than if he invest in 3 per cent. Consols at 93. What sum has he to invest?

In the first investment he gets £6 for every £132 invested. In the second he gets £3 for every £93.

∴ for £132 he will get
As 93 : 132 :: 6 : $4\frac{8}{31}$.
For every £132 invested therefore in No. 1 he gains
$6 - 4\frac{8}{31} = £1\frac{23}{31}$.
No. of £132's to gain £10 16s. =
$£1\frac{23}{31} : £10\frac{4}{5} :: £132 = \underline{£818\ 8s.}$ Ans.

3. A hare is 200 of her own paces before a greyhound. If 2 of the greyhound's paces are equal to 3 of the hare's, but the hare takes 4 while the greyhound takes 3, in how many of the hare's paces will he overtake him?

Each pace of the greyhound is $1\frac{1}{2}$ of the hare's. 3 paces of the greyhound $= 4\frac{1}{2}$ of the hare.
These are taken while the hare travels 4 paces.
Paces to travel to gain $\frac{1}{2} = 4$
" " " $200 = \underline{1600.}$ Ans.

4. If after adding 14 galls. of water to 56 galls. of wine I sell at £1 1s. a gallon, and gain 20 per cent., what was the prime cost of the wine?

Amt. of mixture = 56 + 14 = 70 galls.
Selling price = £73 10s.
£73 10s. = $1\frac{13}{48}$ of cost price.
∴ Cost price = £367 10s. ÷ 6 = £61 5s.
Cost price per gall. = £61 5s. ÷ 56
$= \underline{£1\ 1s.\ 10\frac{1}{2}d.}$ Ans.

History.

MALES AND FEMALES.

1. What claim had George I. to the throne of England?

His claim rested on the terms of the Act of Settlement, which provided that in default of heirs first of William and Mary, then of Anne, then of William and any other wife, the crown should be settled on the granddaughter of James I., and daughter of Elizabeth, Queen of Bohemia, the *Princess Sophia, Electress of Hanover*, being Protestants. George I. was the son of the Electress Sophia, and became king, although there were other families nearer in inheritance, but who were passed over on account of being Roman Catholics.

2. Give some account of the wars in which England was engaged in the early part of the present century.

The century opened with Russia, Denmark, and Sweden uniting to oppose the English system of maritime law (1800), and the chief event of the war which followed was the Battle of Copenhagen on the Baltic, the English gaining a complete victory (1801). Nearly at the same time Sir Ralph Abercromby gained the Battle of Alexandria over the army which Napoleon had left there. In 1802 peace was concluded with Napoleon at Amiens, but was soon broken, owing to a dispute about Malta, which England refused to give up. Napoleon seized Hanover, and prepared to invade this country. His fleet was to sail as if for the West Indies, but suddenly to return, join that of Spain, and make a descent upon our coasts. The fleet did sail but returned, and was defeated by Sir Robert Calder off Cape Finisterre. The Spanish and French fleets effected a junction, but were attacked by Nelson, and totally routed off Cape Trafalgar (1805). Napoleon now tried to ruin British commerce, and as the Danes were likely to help, a British fleet bombarded Copenhagen, 1807. Then followed the war in the Peninsula, and the victories of Wellesley at Vimeiro, Talavera, Badajos, Salamanca, San Sebastian, Vittoria, and Toulouse, ending with Napoleon's abdication, and settlement in Elba. In 1815 he returned, but was defeated at Quatre Bras and Waterloo, and finally banished to St. Helena.

3. What were the Berlin Decree, Test and Corporation Acts, Septennial Bill, Catholic Emancipation Bill, Chartists, Cato Street Conspiracy? Give the dates.

Berlin Decree.—Napoleon had conquered Berlin, and in revenge for the blockade of the whole of the coast from Brest to the Elbe by the English, he issued a decree declaring a blockade of British ports, forbidding all trade with them, and declaring all British goods liable to confiscation (1806).
Corporation Act (1661, repealed 1828). By it every officer

of a corperation was required to take the sacrament according to the rites of the Church of England, and to declare the taking of arms against the king to be in all cases unlawful.

Test Act (1673, repealed 1828). All persons holding civil and military offices had to take the oaths of supremacy and allegiance, and to declare against transubstantiation, and take the sacrament as in Corporation Act.

Septennial Bill (1716). For extending the time of Parliament from three to seven years.

Catholic Emancipation Bill (1829). A bill to allow Catholics to sit in Parliament, and giving them the same rights as Protestants.

Chartists (1838, etc). A number of Reformers, dissatisfied with the Reform Bill, so called because they set forth their claims in a document known as 'The People's Charter.'

Cato Street Conspiracy, (1820). A conspiracy to murder the Cabinet Ministers. Thistlewood the ringleader and four others hanged.

Teaching.

Write the notes of a lesson on 'Clothing.'

I. *Necessity for clothing.* Compare the skin of an animal (cat, dog, horse) with that of a child, and elicit points of difference. The former, thick, hard strong, covered with hair or fur; the latter thin, easily scratched, scorched, or made cold. Nature has not provided man with clothing, or with a thick covering, as in the case of animals, birds, etc. Man must prepare these for himself. Weather necessitates clothing.

II. *Ancient clothing.* Man originally from warm latitudes did not need much; as he went further north, adopted the skins of animals, roughly sewn together. Natives of hot countries often fasten the leaves of trees together as clothing. As man became more civilized gradually adopted other materials for clothing.

III. *Materials Used.* Cotton, wool, silk, hair, flax, skins. Some materials thicker, stronger, and warmer than others. Material used according to the circumstances and means of persons. Woollen a bad conductor of heat, principally used in cold weather. Cotton and linen finer, thinner, and more suitable for warm climates and seasons. Silk more expensive; skins and furs used in cold climates and seasons. Materials spun into threads, woven into cloth, cut into various shapes and sewn together.

IV. *Fashions in Clothing.* These sometimes depend upon the convenience of the wearers. In warm countries the clothes are made of thin material to fit loosely, so as to give freedom of action for the limbs. Where exertion is used and the weather is colder, clothes are made to fit more closely to the skin, to be out of the way and to give heat. Changes in the style of manufacture and the material employed are often made from caprice.

V. *Benefits of Clothing*—

(*a*) Protects the body from exposure to changes of the weather.

(*b*) Forms a covering, which is a mark of civilization.

(*c*) Providing material and manufacture employ immense numbers of people, as farmers, planters, weavers, spinners, etc.

VI. *Lesson on use.* Carefulness, tidiness, and cleanliness needed in clothing as well as in person. Neatness of person and clothing, a passport, if accompanied with other virtues, to respect.

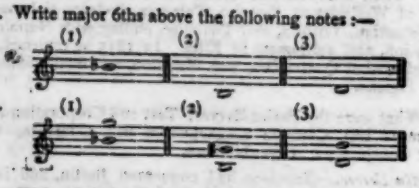
Music.

OLD NOTATION.

A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

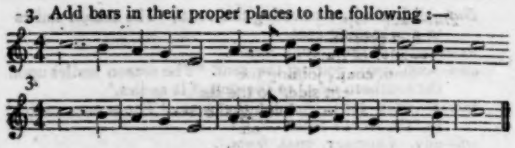
1. Write major 6ths above the following notes :—



2. Write briefly the meaning of the following terms :— (1) *Staccato*; (2) *Allegro*; (3) *Diminuendo*.

2. (1) Each note is to be cut short, detached, separate; (2) quickly; (3) gradually softer.

3. Add bars in their proper places to the following :—



TONIC SOL-FA NOTATION.

1. Write major 6ths above the following notes :—

(1) *ta*; (2) *te*; (3) *ray*.

1. (1) *soh*'; (2) *se*^{l}; (3) *te*.

2. Write briefly the meanings of the following terms :— (1) *Staccato*; (2) *Allegro*; (3) *Diminuendo*.

2. (1) Cut short, separate, detached; (2) quickly; (3) getting gradually softer.

3. Re-write the following, doubling the value of every note. Use four-pulse measure :—

	|	s	,,f	:n		|	s		:d	.t$_1$	|	d		:—	|
3.	|	s	:-.f	| n	:—	|	s	:—	| d	:t$_1$	|	d	:—	|—	:— |

FOURTH YEAR.

Pupil Teachers at end of Fourth Year.

FIRST PAPER.

Three hours and a half allowed.

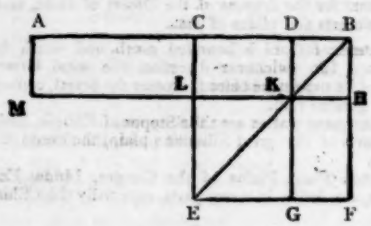
Euclid.

MALES.

1. If a straight line be divided into any two parts, the square of the whole line is equal to the squares of the two parts, together with the rectangle contained by the parts.

Euclid, Book II., Prop. 4.

2. The rectangle contained by the two parts into which any line is divided is greatest when the line is bisected.



Let AB be any straight line, and let it be divided into two equal parts at C, and into any two unequal parts at D.

The rect. AC,CB is > rect. AD,DB.

On CD describe the sq. CF. Join BE. Through D draw DG parallel to CE or BF cutting BE in K. Through K draw HKLM parallel to AB. Through A draw AM parallel to CE.

Because AC=CB, the rect. AL=rect. CH (I. 36).

And the complement CK=comp. KF (I. 43).

To each add DH. Then CH=BG.

But CH=AL. ∴ BG=AL (Ax. 1).

To each add CK. ∴ AL=gnomon CHG.

But AL=rect. AD,DB, because DK=DB.

∴ Gnomon CHG=rect. AD,DB.

And gnomon CHG is less than CF, the sq. on CB, by the sq. LG. Then rect. AD,DB is less than sq. on CB by sq. LG; *i.e.*, the sq. on CB which is the rect. AC, CB is > rect. AD,DB by sq. LG. Therefore the rect. contained by the two parts of a divided line is greatest when the line is bisected.

Q.E.D.

3. To describe a square that shall be equal to a given rectilineal figure.

Euclid, Book II., Prop. 14.

Algebra.

1. What is meant by the least common multiple of two or more expressions?

Find the L.C.M. of—

$$x^4-1 \text{ and } x^4+x^3+2x^2+x+1$$

The least common multiple of two or more expressions is the least expression into which each will divide without a remainder.

The L.C.M. may be found by resolving the given expressions into factors, or by dividing each by their greatest common measure, and multiplying the G.C.M. and quotients together.

Factors:—

$$x^4-1=(x^2+1)(x+1)(x-1)$$
$$x^4+x^3+2x^2+x+1=(x^2+1)(x^2+x+1)$$

The G.C.M. is $\therefore (x^2+1)$ and

the L.C.M. is $\underline{(x^2+1)(x^2+x+1)(x+1)(x-1)}$. Ans.

2. Reduce $\frac{a^3+x^3}{a^4+a^2x^2+x^4}$ to its lowest terms, and prove that

$$(a+b)^2+2(a^2-b^2)+(a-b)^2=(2a)^2.$$

$$(a)\quad \frac{a^3+x^3}{a^4+a^2x^2+x^4}$$
$$=\frac{(a+x)(a^2-ax+x^2)}{(a^2+ax+x^2)(a^2-ax+x^2)}$$
$$=\underline{\frac{a+x}{a^2+ax+x^2}}. \text{ Ans.}$$

$$(b)\quad (a+b)^2+2(a^2-b^2)+(a-b)^2=(2a)^2$$
$$(a^2+2ab+b^2)+2a^2-2b^2+(a^2-2ab+b^2)=4a^2$$
$$4a^2+2ab-2ab+2b^2-2b^2=4a^2$$
$$\underline{4a^2=4a^2}. \text{ Ans.}$$

3. Solve two of the following equations:—

$$(a)\quad \frac{1}{x+1}+\frac{1}{x}=\frac{1}{6}.$$
$$(b)\quad x+2\sqrt{(x^2+5x+2)}=10.$$
$$(c)\quad \frac{x}{a}+\frac{a}{x}=\frac{x}{b}+\frac{b}{x}.$$

$$(a)\quad \frac{1}{x+1}+\frac{1}{x}=\frac{1}{6}$$
$$6x+6x+6=5x^2+5x$$
$$5x^2-7x=6$$
$$x^2-\tfrac{7}{5}x=\tfrac{6}{5}$$
$$x^2-\tfrac{7}{5}x+(\tfrac{7}{10})^2=\tfrac{6}{5}+(\tfrac{7}{10})^2 \text{ or } \tfrac{169}{100}$$
$$x-\tfrac{7}{10}=\pm\tfrac{13}{10}$$
$$x=\pm\tfrac{13}{10}+\tfrac{7}{10}$$
$$\underline{x=2,\ -\tfrac{3}{5}}. \text{ Ans.}$$

$$(b)\quad x+2\sqrt{(x^2+5x+2)}=10$$
$$2\sqrt{(x^2+5x+2)}=10-x$$
$$4(x^2+5x+2)=100-20x+x^2$$
$$4x^2+20x-x^2=100-8$$
$$3x^2+40x=92$$
$$x^2+\tfrac{40}{3}x+(\tfrac{20}{3})^2=92+(\tfrac{20}{3})^2=\tfrac{1324}{9}$$
$$x+\tfrac{20}{3}=\pm\tfrac{2\sqrt{331}}{3}$$
$$x=\pm\tfrac{2\sqrt{331}}{3}-\tfrac{20}{3}$$
$$\underline{x=2,\ -15\tfrac{1}{3}}. \text{ Ans.}$$

$$(c)\quad \frac{x}{a}+\frac{a}{x}=\frac{x}{b}+\frac{b}{x}$$
$$bx^2+a^2b=ax^2+ab^2$$
$$bx^2-ax^2=ab^2-a^2b$$
$$x^2(b-a)=ab(b-a)$$
$$x^2=\frac{ab(b-a)}{(b-a)}$$
$$x^2=ab$$
$$\underline{x=\pm\sqrt{ab}}. \text{ Ans.}$$

Mensuration.

1 What is the rule for finding the area of a circle, the diameter being given?

Find the difference in the surfaces of a shilling and a half-crown, the diameter of the former being $\frac{12}{16}$ in. and the latter $1\frac{1}{4}$ inches.

Rule.—Square the diameter, and multiply by ·7854.

To compare the surfaces of the coins mult. sum of diams. by diff. of diams. and product by ·7854.

$$\therefore (1\tfrac{1}{4}+\tfrac{12}{16})(1\tfrac{1}{4}-\tfrac{12}{16})(\cdot7854)$$
$$=\tfrac{32}{16}\times\tfrac{1}{16}\times\cdot7854$$
$$=\frac{137\cdot445}{\cdot7854}$$
$$=\underline{\cdot53689\ldots}. \text{ Ans.}$$

Arithmetic.

FEMALES.

1. At what rate per cent. per annum will £612 10s. produce £2 0s. 10d. per month?

Int. per annum = £2 0s. 10d. × 12 = £24 10s.;

$\therefore$ £612 10s. : £100 :: £24 10s. : $\underline{£4}$. Ans.

2. If 15 men build a wall 25 yds. long, 2 yds. high, 2 ft. thick in 14 days, how long will it take 7 men to build a wall 30 yds. long, 7 ft. high, and 1 ft. thick?

Men 7 : 15 :: 14 days : $\underline{15\tfrac{3}{4}}$ days. Ans.

Yds. 25 : 30

Ft. 8 : 7

Ft. 2 : 1

3. How long has a bill to run if the discount on £929 10s. calculated at $2\frac{1}{2}$ per cent. is £49 10s.?

P. W. = £929 10s. − £49 10s. = £880.

£880 will produce in 1 yr., $\frac{£880\times2\frac{1}{2}}{£100}=\underline{£22}$.

£22 : £49 10s. :: 1 yr. : $\underline{2\frac{1}{4}\text{ yrs.}}$ Ans.

4. I sell £5,000 4 per cent. stock @ 108, and invest the proceeds in 5 per cents. at 120. Do I gain or lose? and how much a year?

£100 : £5000 :: £4 : $\underline{£200}$ first income.

£100 : £108 :: £5000 : $\underline{£5400}$, proceeds of sale.

£120 : £5400 :: £5 : $\underline{£225}$ second income.

£225 − £200 = $\underline{£25}$ gain per year. Ans.

Grammar.

MALES AND FEMALES.

1. Pleasures lie *thickest where* no pleasures *seem*;
   There's not a leaf that falls upon the ground
   But holds some joy, of silence or of sound,
   Some sprite *begotten* of a summer dream.
   The very meanest things are made *supreme*
   With innate ecstasy. No *grain* of sand
   But moves a bright and million-prophet land,
   And *hath* its Eden and its Eves, I deem.

Paraphrase the above passage.

Pleasures are most plentiful where they seem least to abound. Joy untold, heard or silent, is centred in the falling of a leaf, which is the abode of some memory of the bright and happy days gone by. Those things which we account of least moment become exalted to highest note by the happiness they contain, unseen and unfelt by us. Every grain of sand is peopled with its unnumbered creatures, and has its places of happiness and its forms to love.

2. Point out the subordinate sentences, and parse the words in italics.

Adv. sent., Where no pleasures seem.

Adj. sent., That falls upon the ground.

Adj. sent., But holds some joy.

[NOTE.—But = which not.]

Adj. sent., But moves a bright land.

Thickest—adv. of manner, qual. 'lie.'

where—advl. conj., joining the sent., 'Pleasures lie' and 'No pleasures seem.'

seem—reg. int. verb, act., ind. pres., 3rd, agreeing with its nom., *pleasures*.

but—= *which not*: *which*—rel. pro. sing., 3rd., neut., nom. to *holds*.

not—adv. of negation, qual. 'holds.'

but—a cop. disj. conj., joining the sent., 'There is not a leaf' and 'It holds.'

holds—irreg. trans. verb, act., ind., pres., 3rd, sing., agree with *which* or *it*.

[Former construction gives meaning, and is grammatical. The latter is less so. It is evident, however, that the latter is the construction intended, from the way *and hath* is used in line 8.

begotten—past part. of *to beget*, refg. to *sprite*.

supreme—adj. of quality, qual. *things*.

grain—com. noun, sing., neut., nom. after *is*.

hath—irreg. trans. verb, act., ind., pres., 3rd, sing., agreeing with *it*.

3. From what sources has the English language been enriched? Give one or two words from each source.

English has been enriched by additions from almost every known language. In addition to the great classes, Latin and Greek, it contains words from

Spanish—Cigar, indigo.
Portuguese—Mandarin, cobra.
Italian—Gondola, comrade.
Dutch—Boor, schooner.
Arabic—Damask, hazard.
Persian—Orange, lilac.
Hindi—Chintz, durbar.
Chinese—Satin, tea.
Turkish—Bey, fez.
Malay—Caddy, gong.
Hebrew—Cherub, Sabbath.
American—Mahogany, wigwam.
Russian—Czar, drosky.

Geography.

MALES AND FEMALES.

1. Draw a map of one of the following:—

(*a*) Central America and Mexico.
(*b*) The east coast of Asia.
(*c*) The Indian Ocean.

2. Give a short description of the Solar system.

The Solar system consists of the sun and the planetary bodies which revolve round it as a centre.

Of these planets, the chief, ranged in the order of nearness to the sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. These are from 37 millions to 2,852 millions of miles from the sun, round which they revolve in times varying from 88 days to 164 years.

The Earth, Jupiter, Saturn, and Neptune, are attended by one or more satellites, called moons.

Besides these principal planets, there are between Mars and Jupiter, a number of small planets called Asteroids, and at varying distances from the sun, and moving round it in elliptical orbits, a number of bodies called comets. Besides making their annual revolution round the sun, each planet turns on its axis, and also proceeds along with the sun in space.

3. Write an account of the physical characteristics of Africa.

Africa is the least known of the great continents. It is situated chiefly in the Torrid Zone, and its coast line is almost unbroken.

The only openings of importance are, the Gulf of Sidra in the north, the Bights of Benin and Biafra in the west, and Delagoa and Algoa Bays in the east. The Red Sea separates it partially from Asia on the north-east.

Africa may be said to be divided into two parts, north and south.

The northern part is broadest, and consists for the most part of an immense sandy tract of country called the Sahara, bounded by a more fertile tract round the coast, and across the south.

To the west of this division are the Atlas Mountains, parallel with the coast, while in the east is the River Nile, the longest river of Africa. Running into the Atlantic there is the River Niger.

The southern part of Africa is narrower, more elevated, and better watered than the north. It is a slightly elevated plateau, and drained by the Zambesi and the Congo, which are fed from a series of large lakes near the Equator, the chief of which are Victoria Nyanza, Albert Nyanza, Nyassa, and Tanganyika.

The ranges of mountains in the north-east of the division are the Abyssinian Mountains, and in the south the Nieuweldt Mountains.

The whole of southern and equatorial Africa has become better known through the explorations of Livingstone, Stanley, Cameron, and others of late years.

SECOND PAPER.

Two hours and a half allowed.

Needlework.

FEMALES.

The needlework specimens will be collected by the Inspector at the expiration of one hour after the distribution of the examination paper.

Arithmetic.

MALES.

1. Men, women, and children whose comparative numbers are as 4, 5, and 6, and their weekly wages 5, 4, 3, work respectively 3, 2, and 1 weeks, earning together £2360; what share did each class receive?

Units of receipts =
Men $(4\times5\times3)$, women $(5\times4\times2)$, and children $(6\times3\times1)$
$=60+40+18.$
$=118.$

Men receive $\frac{60}{118}$ of 2360 = £1200
Women ,, $\frac{40}{118}$ of 2360 = £800
Children ,, $\frac{18}{118}$ of 2360 = £360
} Ans.

2. Define proportion. What number must be subtracted from each of the following numbers so that they may be in proportion 3, 4, 5, and 7?

Proportion is the equality of two ratios, and is made up of four terms; the first of which bears the same relation to the second that the third does to the fourth.

One; for then the numbers will be 2, 3, 4, and 6, and as the second is $1\frac{1}{2}$ times the first, so the fourth is $1\frac{1}{2}$ times the third.

3. A person purchases stock at $94\frac{1}{4}$, receives a half-yearly dividend at 3 per cent. per annum, and at the end of three months sells out at 93; what per cent. has he gained or lost, the broker having had commission on both transactions?

Amount paid $=94\frac{1}{4}+\frac{1}{4}=94\frac{1}{2}$
Amount received $=1\frac{1}{2}+92\frac{1}{2}$
$=94\frac{1}{2}$
Loss $=94\frac{1}{2}-94\frac{1}{4}=\frac{1}{4}$. Ans.

4. What is meant by 'discount'? Find what deduction a banker would make from a bill of £700 due 4 months hence at 4 per cent. per annum, and what he would gain by the transaction?

Discount is a deduction made for the payment of ready money, or of a debt before it is due.

Commercial discount is the interest on the debt. True discount is the interest of the present worth.

A banker would deduct $\frac{£700\times4\times\frac{1}{3}}{100}=£9\ 6s.\ 8d.$

The real discount is £9 4s. $2\frac{2}{11}$d.; for £100 would produce $£4\times\frac{1}{3}=£1\frac{1}{3}$.

$101\frac{1}{3}:700::1\frac{1}{3}:£9\ 4s.\ 2\frac{2}{11}d.$

The banker therefore gains

£9 6s. 8d. − £9 4s. $2\frac{2}{11}$d. = 2s. $5\frac{9}{11}$d. Ans.

History.

MALES AND FEMALES.

1. What were the chief incidents of the War of the Spanish Succession with dates? Who were the chief persons and peoples engaged in the war?

The Battle of Blenheim in 1704, capture of Gibraltar 1704, capture of Barcelona 1705, Battle of Ramlies 1706, Almanza, 1707; Oudenarde 1708, Malplaquet 1709, capture of Mons, 1709.

England, Holland, and Germany united against Louis XIV., who attempted to place his grandson Philip on the throne of Spain. The Allies were in favour of the claim of Archduke Charles of Austria. Churchill, Duke of Marlborough, and Prince Eugene, Charles Mordaunt, Earl of Peterborough, and Sir George Rooke were the English leaders. Marshal Tallard and Duke of Berwick the French.

2. How is it that the House of Commons is more powerful than the House of Lords? What is the chief source of its power?

The chief source of the power of the House of Commons lies in the fact that it only has the power of initiating money bills; it commands the purse of the country. Besides, the members of the House of Commons are the direct representatives of the electors, and as such hold more responsible positions than members of the House of Lords. A member of the House of

Commons can with the aid of others prevent the supply of money to carry on the Government of the country by objecting to its being voted in Committee of Supply, till the grievances of which his constituents complain are remedied.

3. Give an account of the Chartist agitation.

The Chartists were principally of the lower classes—men who believed that their condition could only be improved by Parliamentary reforms. They received their name from the document which contained a statement of the reforms they sought, viz., universal suffrage, vote by ballot, equal electoral districts, annual Parliaments, abolition of property qualification, and payment of members. Riots were prevalent in 1839, but it was not till the year of the French Revolution that they showed themselves fully. In that year (1848) they met on Kennington Common, and then marched through London to the House of Commons, bearing a huge petition, which the member for Nottingham, Feargus O'Connor, was to present. They were not allowed, however, to cross the bridges in procession. The affair passed off quietly, without the aid of the special constables or the soldiery. The Chartists from this time ceased to be of any importance politically. Several of the ringleaders were imprisoned, and four of their demands have since been practically conceded.

Teaching.

WRITE NOTES OF A LESSON ON 'VENTILATION.'

Draw attention to the room where the class is, and elicit difference between air in it and outside. Inside it is sometimes *warm*, *close*, and *disagreeable*. Fresh air is needed.

I. *Necessity for Ventilation.*—The breath exhaled from the body brings with it the products of combustion in the lungs, and some of the waste matter from the body. The pores of the skin are constantly giving off *effete, unwholesome* matter. If the air were unchanged it would gradually cease to support life, would act as a poison. Hence I.

II. *Principle of Ventilation.*—Heated air expands, becomes lighter and rises: cold air heavier. Needed: exit for warm air, inlet for cold air, former near the roof, latter lower. Call attention to doors and windows. Why not well suited for ventilation? *Draughts*—hence *colds, chills, fevers.*

III. *Methods of Ventilation.*—Where no other, doors, windows have to be used. Best inlets in floors and walls, outlets near the ceiling. (Draw sketch of inside of room, showing inlets in floors and walls.) Great attempts made to prevent draughts. Different kinds of ventilators used. *Arnott's* good, and *Tobin's.*

IV. *Lessons.*—Personal attention to ventilation; opening of bedroom windows, prevention of too great heat in rooms, so as not to risk sudden changes of temperature. Every means should be taken to avoid uncleanly habits of person or clothing.

Music.

OLD NOTATION.

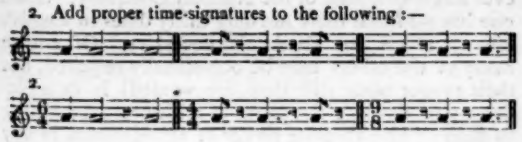
A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

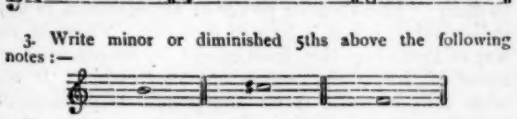
1. Write in the treble clef the ascending scale of B minor, using the sharp 6th and 7th.

1.

2. Add proper time-signatures to the following:—

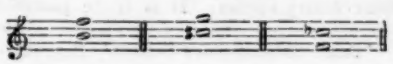


2.



3. Write minor or diminished 5ths above the following notes:—

3.



TONIC SOL-FA NOTATION.

1. Write the ascending minor scale from *lah*$_1$ to *lah*, using the sharp 6th and 7th.

1. *Lah*$_1$, *te*$_1$, *doh*, *ray*, *me*, *fah*, *se*, *lah.*

2. Write augmented 2nds above the following notes:—(1) *soh*; (2) *fah*; (3) *doh.*

2. (1) *le*; (2) *se*; (3) *re.*

3. Re-write the following, halving the value of every note:—

| m	:—	| f	:- .m	| r .d :m	| s .l :s |

3.

| m		:f	.m	| r,d .m	:s,l .s |

How to Teach History.

BY ISABELLA LANDALE.

(Continued from page 154.)

FIXING THE IMPRESSIONS.

AFTER the new impression has been made, and 'questioned in' to the pupils' minds, the teacher should quickly recapitulate the chief points of what he has been teaching. After he has done that, he should give each head of the summary in simple language, which the whole of the pupils are to repeat after him simultaneously; partly to impress the different heads, and partly, by practice, to give them ease of utterance and clearness of language in their answers. This being done, the work of the previous day should now be gone over, and 'questioned out' of the pupils, it having been the task appointed for their home preparation. It is hardly necessary to say that throughout this second course it is imperative that the pupils have sufficient home work to do, so as to study themselves into a familiarity with the substance of each lesson. However, it would not be advisable to leave the important matter of a first impression to the chances of home preparation, in which a child is subject to interruption, to possible confusion of ideas from 'help' afforded by incompetent persons, and, above all, to varying degrees of physical exhaustion resulting from the work of the day. Besides, however excellent the text-book, one cannot be sure that it is perfectly understood by every child, till made clear by the practical skill in rendering his subject intelligible which belongs to a good teacher. But it is only in making this first impression that the teacher is the agent; most of the other work must be done by the children. It must never be forgotten that one of the aims of all education is to cultivate the habit of hard work, without which no real mental discipline is obtained, and no permanent knowledge acquired.

Besides hearing the lessons, and testing the general knowledge of history that has been acquired, the teacher must select the events of real importance from the mass in which they are imbedded, with a view to fixing them permanently in the minds of the pupils. This matter of selection is a work of no small difficulty, for the events chosen must not only be important in themselves, but must have a thread of connection running through them, if they are to be available as permanent mental acquirements. Except in so far as they are instrinsically important, the merely personal and picturesque features need not now be dwelt on; they will take care of themselves. The events to be retained are not specially those remarkable in themselves, but those which have the most important results on the country, socially, politically, and morally.

CULTIVATION OF THE MEMORY BY APPLYING ITS LAWS TO THE RETENTION OF THE INDISPENSABLE PARTS OF HISTORY.

We would lay great stress on the arrangement of this epitome according to the laws of memory; for this is the key of the whole situation, not only as regards retention of the facts, but also as regards cultivation of the retentive powers. Without this the memory is not trained, but simply crammed and overburdened. One great aim in these epitomes should be to avoid any unnecessary strain on the memory by attempting to retain what is of no consequence. Some periods of history, being much more important than others, should receive more attention than those comparatively barren periods which have had little influence on human affairs. Above all, the teacher must be sure that the epitome is not too abstract for the pupils to comprehend, for they can never remember what they do not understand. It is so easy for a highly-educated adult to generalise himself, that he is apt to forget that it is an unknown process to those he addresses; especially as the children have no difficulty in acquiring a merely mechanical and parrot-like familiarity with the words of such an epitome, although they may never give a thought to its meaning.

It is only after the events themselves are thoroughly familiar to the class, that the epitome which is to be permanently retained is to be presented to the pupils; then each step is taken on known ground, and each is the natural consequence of what preceded—in short, the epitome may be described as the synthesis of what has been before subjected to analytical study. This epitome, meant for permanent retention, is to be distinguished from the summary of each day's lesson, which is merely an orderly arrangement of materials from which the epitome is afterwards to be built.

Of course it is too much to expect that a child should be able himself to select the most important facts from the period of history he has been studying, as his mental powers are not sufficiently developed for such an exercise. The teacher, however, should endeavour to approach such an ideal as nearly as is consistent with the evolution of the child's powers, and, instead of presenting the epitome in a completed form, 'cut and dry' (to use a colloquial expression which exactly describes the usual characteristics of such epitomes), he should, as it were, obtain the help of the class in forming the epitome. This should be done by means of skilful questioning, which should lead them gradually up to the formation of one point at a time. The teacher will use his own discretion as to how much of this work should be done in one day; but whenever he has secured one point, he should mark it up conspicuously on the blackboard, after which each pupil should copy it in a book kept for the purpose.

By degrees the whole epitome will be inscribed on the blackboard and in the books, after which it should be repeated simultaneously by the class several times. The pupils are thus early introduced to the principle and practice of an orderly arrangement of ideas; and it should be impressed on them that only by such means can we retain any acquirements whatever. The links of association should be traced, and made clear to them, and they might even be encouraged to form such for themselves in all their studies.

Better that children should not learn history at all than that they should encounter the hopeless jumble of unconnected facts, and the utter confusion of ideas, which too often do duty in its name.

An epitome of carefully selected facts such as we describe should be chosen, with a view to rational association between the points to be remembered; and the relation of cause and effect should be clearly traced out to the pupils. The first link in the chain of association should be specially emphasised, for if it is made secure the rest will naturally follow; indeed, after some repetition, the first link will not only recall automatically the other links in the chain, but will reproduce vividly the general features of the whole period they epitomise. As long as facts cannot be recalled without a laborious effort, they are not really a possession of the mind; it is only when the recollection of them can be called up automatically, on touching a given spring, that they are really our own.

In all such schemes, time is an important element of order, indeed 'we should as little expect a knowledge of history without a clear system of chronology, as to find a human body without a skeleton.' It is, therefore, extremely important not only to have an absolute knowledge of the indispensable dates, but also to cultivate the feeling of time or contemporaneousness, which is not so generally attended to.

The acquisition of dates is, without doubt, the most unpleasant part of the study of history, except to those specially gifted with a memory for figures. In this department we would introduce the most sweeping reforms, by confining our attention exclusively to the indispensable, and boldly throwing the rest overboard—no great sacrifice after all, for no one remembers the appalling masses of dates which had to be unwillingly learned in childhood.

The saving of labour thus effected leaves the pupil free to acquire, with absolute certainty, the few dates which are indispensable, and as these will naturally be taken as they arise in the course, they will not be felt oppressive. Every child must be made to feel that he shall not be allowed to escape without knowing them thoroughly; and constant daily reiteration of one date till it is absolutely familiar will soon impress it indelibly. This may be done at first by repeated simultaneous utterance of the date required, at the same time, of course, mentioning the event with which it is connected; then each child, after an interval, should be asked to write the date on his slate for inspection. After it is fairly acquired it may be entered in the epitome-book. Really important dates are more easily retained than others, because the mind has an unconscious sense of their necessity, and hence a hearty and determined effort is made to acquire them. Who ever forgets the date of the Norman Conquest? Some one has said that there are only thirty dates in English history which are absolutely necessary. Of course many of the others may be occasionally required, but their proper place (till they are wanted) is in a dictionary of dates or the pages of a history. According to Bain: 'The absolute power of retentiveness in any individual mind is a limited quantity. There is no way of extending this limit except by encroaching on some of the other powers of the mind.'* If so, what folly to waste it on the painful acquisition of such unnecessary matter. It is quite possible, how-

* Bain's 'Education as a Science.' Page 121.

ever, to acquire a feeling of time or contemporaneousness without having recourse to dates, and this in a manner involving much less mental strain. For instance: in studying the history of Europe the pupils might do historical maps representing a certain epoch, with the name of the reigning monarch in each country, and the names of the most celebrated men of the time opposite the towns in which they were born, or with which their memories are specially connected.

Such a semi-pictorial impression would be much more easily recalled than a mass of dates, and it would have this advantage, that by the power of association the recollection of one name would bring along with it those we were accustomed to see in juxtaposition, and the law of contiguity would thus lend its powerful aid to memory. Metaphysicians tell us that memory is more closely connected with the physical state than any of the other mental faculties; so it may not be unreasonable to argue that it is also more closely connected with the senses, and, therefore, more easily stimulated through them; and, of all the senses, that of vision lends itself most effectively to educational purposes. What we hear we may not attend to, but what we see forces itself on our notice.

This, besides being easier, is a higher form of memory than the mere parrot-like reproduction of certain figures in conjunction with certain events. As there is nothing in figures themselves to call forth associations, it takes a great amount of volitional recollection to recall them; whereas, by the plan we have described, one act of volition alone is required to initiate the automatic reproduction of a whole period of history.

The difference between the mode of learning by the accumulation of dry dates and the mode we have indicated is as great as the difference between volitional recollection and automatic reproduction; and we must remember that volitional recollection is necessarily extremely limited, but the limits of automatic reproduction have not yet been discovered. Another recommendation of this system is that it interests the pupils by giving them something to do for themselves, a point of great importance in education.

As all automatic mental action is the result of habit, it can only be produced by repetition, which has been described as the oldest teaching device. The necessity for this is somewhat lessened by the depth and clearness of the first impression; but the fact remains that all permanent knowledge must be engraved by repetition: so we have now to consider revisal as a still further aid to fixing impressions. The epitomes and the indispensable dates must then be committed to memory, although, if they have been learnt as we suggest, they will, as it were, have grown into the memory. Still, they must be indelibly impressed by frequent repetitions. Every time that they are repeated the thread that connects them should be mentioned, as well as the facts that are strung on it.

As this part of the work naturally partakes more of the character of drudgery than the preceding, various devices may be resorted to to keep up the interest. These devices should be held in reserve for such work as this, and used as a means of lightening the labour of revisal, when the freshness of the subject no longer commands interest naturally. For instance, let one pupil write the summary on the blackboard, and be corrected by the others; or let the pupils be allowed to ask each other questions.

In revisal recourse might be had to the class matches of the Jesuits, which have been employed with great success by at least one modern educator. The class is divided into parties, and arranged on two sides like a country dance. The subject is given out beforehand, and the boys themselves prepare their questions, which they ask each other in rotation, each boy trying to puzzle the one opposite to him, the victory, of course, being awarded to the side most successful in answering.

'The importance of reiteration was well understood by the Jesuits, who have been so successful as educators; and they carried the principle so far that, besides the devotion of one day in the week to repetition in the lower classes, the desire of laying a solid foundation even led to the second six months of the year being given to again going over the work of the first six months.'*

However, as modern educators have far outstripped the Jesuits in the art of making a deep impression at first, and in the consecutive arrangement of ideas of scientific principles, they are able to attain the same end with much less physical fatigue to the pupils, and much less weariness of spirit, than would be caused by carrying the mechanical part of the revisal to the height done by the Jesuits. They are, therefore, free to devote more attention to the third and most important end in teaching history—that is, the use of it as a means of cultivating the judgment.

(To be continued.)

Publications Received.

Cassell and Co., Limited—
Handbook of the New Code. By J. F. Moss.

Gill (G.) and Son—
The Theory and Practice of Double Entry Book-keeping. By A. Sarll.

Heywood (John)—
Proceedings of the Conference on Education under Healthy Conditions.
Fifty Examination Papers in Dictation and Grammar.
Sketches from Church History. By Mrs. Toogood.

Isbister (Wm.) Limited—
Object Lessons and How to Give Them. By G. Ricks, B.Sc.

Johnston (A.)—
Illustrations of the Manufacture of Iron:—
No. 1. The Smelting Furnace.
No. 2. Cast and Wrought Iron.
Do. Flax and Linen. Nos. 1 and 2.
The History of a Lump of Gold. By A. Watt.

Johnston (W. and A. K.)—
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The Cornhill Magazine. June.

* 'Essays on Educational Reformers,' by Rev. R. H. Quick.

CULTIVATION OF THE MEMORY BY APPLYING ITS LAWS TO THE RETENTION OF THE INDISPENSABLE PARTS OF HISTORY.

We would lay great stress on the arrangement of this epitome according to the laws of memory; for this is the key of the whole situation, not only as regards retention of the facts, but also as regards cultivation of the retentive powers. Without this the memory is not trained, but simply crammed and overburdened. One great aim in these epitomes should be to avoid any unnecessary strain on the memory by attempting to retain what is of no consequence. Some periods of history, being much more important than others, should receive more attention than those comparatively barren periods which have had little influence on human affairs. Above all, the teacher must be sure that the epitome is not too abstract for the pupils to comprehend, for they can never remember what they do not understand. It is so easy for a highly-educated adult to generalise himself, that he is apt to forget that it is an unknown process to those he addresses; especially as the children have no difficulty in acquiring a merely mechanical and parrot-like familiarity with the words of such an epitome, although they may never give a thought to its meaning.

It is only after the events themselves are thoroughly familiar to the class, that the epitome which is to be permanently retained is to be presented to the pupils; then each step is taken on known ground, and each is the natural consequence of what preceded—in short, the epitome may be described as the synthesis of what has been before subjected to analytical study. This epitome, meant for permanent retention, is to be distinguished from the summary of each day's lesson, which is merely an orderly arrangement of materials from which the epitome is afterwards to be built.

Of course it is too much to expect that a child should be able himself to select the most important facts from the period of history he has been studying, as his mental powers are not sufficiently developed for such an exercise. The teacher, however, should endeavour to approach such an ideal as nearly as is consistent with the evolution of the child's powers, and, instead of presenting the epitome in a completed form, 'cut and dry' (to use a colloquial expression which exactly describes the usual characteristics of such epitomes), he should, as it were, obtain the help of the class in forming the epitome. This should be done by means of skilful questioning, which should lead them gradually up to the formation of one point at a time. The teacher will use his own discretion as to how much of this work should be done in one day; but whenever he has secured one point, he should mark it up conspicuously on the blackboard, after which each pupil should copy it in a book kept for the purpose.

By degrees the whole epitome will be inscribed on the blackboard and in the books, after which it should be repeated simultaneously by the class several times. The pupils are thus early introduced to the principle and practice of an orderly arrangement of ideas; and it should be impressed on them that only by such means can we retain any acquirements whatever. The links of association should be traced, and made clear to them, and they might even be encouraged to form such for themselves in all their studies.

Better that children should not learn history at all than that they should encounter the hopeless jumble of unconnected facts, and the utter confusion of ideas, which too often do duty in its name.

An epitome of carefully selected facts such as we describe should be chosen, with a view to rational association between the points to be remembered; and the relation of cause and effect should be clearly traced out to the pupils. The first link in the chain of association should be specially emphasised, for if it is made secure the rest will naturally follow; indeed, after some repetition, the first link will not only recall automatically the other links in the chain, but will reproduce vividly the general features of the whole period they epitomise. As long as facts cannot be recalled without a laborious effort, they are not really a possession of the mind; it is only when the recollection of them can be called up automatically, on touching a given spring, that they are really our own.

In all such schemes, time is an important element of order, indeed 'we should as little expect a knowledge of history without a clear system of chronology, as to find a human body without a skeleton.' It is, therefore, extremely important not only to have an absolute knowledge of the indispensable dates, but also to cultivate the feeling of time or contemporaneousness, which is not so generally attended to.

The acquisition of dates is, without doubt, the most unpleasant part of the study of history, except to those specially gifted with a memory for figures. In this department we would introduce the most sweeping reforms, by confining our attention exclusively to the indispensable, and boldly throwing the rest overboard—no great sacrifice after all, for no one remembers the appalling masses of dates which had to be unwillingly learned in childhood.

The saving of labour thus effected leaves the pupil free to acquire, with absolute certainty, the few dates which are indispensable, and as these will naturally be taken as they arise in the course, they will not be felt oppressive. Every child must be made to feel that he shall not be allowed to escape without knowing them thoroughly; and constant daily reiteration of one date till it is absolutely familiar will soon impress it indelibly. This may be done at first by repeated simultaneous utterance of the date required, at the same time, of course, mentioning the event with which it is connected; then each child, after an interval, should be asked to write the date on his slate for inspection. After it is fairly acquired it may be entered in the epitome-book. Really important dates are more easily retained than others, because the mind has an unconscious sense of their necessity, and hence a hearty and determined effort is made to acquire them. Who ever forgets the date of the Norman Conquest? Some one has said that there are only thirty dates in English history which are absolutely necessary. Of course many of the others may be occasionally required, but their proper place (till they are wanted) is in a dictionary of dates or the pages of a history. According to Bain: 'The absolute power of retentiveness in any individual mind is a limited quantity. There is no way of extending this limit except by encroaching on some of the other powers of the mind.'* If so, what folly to waste it on the painful acquisition of such unnecessary matter. It is quite possible, how-

* Bain's 'Education as a Science.' Page 121.

ever, to acquire a feeling of time or contemporaneousness without having recourse to dates, and this in a manner involving much less mental strain. For instance: in studying the history of Europe the pupils might do historical maps representing a certain epoch, with the name of the reigning monarch in each country, and the names of the most celebrated men of the time opposite the towns in which they were born, or with which their memories are specially connected.

Such a semi-pictorial impression would be much more easily recalled than a mass of dates, and it would have this advantage, that by the power of association the recollection of one name would bring along with it those we were accustomed to see in juxtaposition, and the law of contiguity would thus lend its powerful aid to memory. Metaphysicians tell us that memory is more closely connected with the physical state than any of the other mental faculties; so it may not be unreasonable to argue that it is also more closely connected with the senses, and, therefore, more easily stimulated through them; and, of all the senses, that of vision lends itself most effectively to educational purposes. What we hear we may not attend to, but what we see forces itself on our notice.

This, besides being easier, is a higher form of memory than the mere parrot-like reproduction of certain figures in conjunction with certain events. As there is nothing in figures themselves to call forth associations, it takes a great amount of volitional recollection to recall them; whereas, by the plan we have described, one act of volition alone is required to initiate the automatic reproduction of a whole period of history.

The difference between the mode of learning by the accumulation of dry dates and the mode we have indicated is as great as the difference between volitional recollection and automatic reproduction; and we must remember that volitional recollection is necessarily extremely limited, but the limits of automatic reproduction have not yet been discovered. Another recommendation of this system is that it interests the pupils by giving them something to do for themselves, a point of great importance in education.

As all automatic mental action is the result of habit, it can only be produced by repetition, which has been described as the oldest teaching device. The necessity for this is somewhat lessened by the depth and clearness of the first impression; but the fact remains that all permanent knowledge must be engraved by repetition: so we have now to consider revisal as a still further aid to fixing impressions. The epitomes and the indispensable dates must then be committed to memory, although, if they have been learnt as we suggest, they will, as it were, have grown into the memory. Still, they must be indelibly impressed by frequent repetitions. Every time that they are repeated the thread that connects them should be mentioned, as well as the facts that are strung on it.

As this part of the work naturally partakes more of the character of drudgery than the preceding, various devices may be resorted to to keep up the interest. These devices should be held in reserve for such work as this, and used as a means of lightening the labour of revisal, when the freshness of the subject no longer commands interest naturally. For instance, let one pupil write the summary on the blackboard, and be corrected by the others; or let the pupils be allowed to ask each other questions.

In revisal recourse might be had to the class matches of the Jesuits, which have been employed with great success by at least one modern educator. The class is divided into parties, and arranged on two sides like a country dance. The subject is given out beforehand, and the boys themselves prepare their questions, which they ask each other in rotation, each boy trying to puzzle the one opposite to him, the victory, of course, being awarded to the side most successful in answering.

'The importance of reiteration was well understood by the Jesuits, who have been so successful as educators; and they carried the principle so far that, besides the devotion of one day in the week to repetition in the lower classes, the desire of laying a solid foundation even led to the second six months of the year being given to again going over the work of the first six months.'*

However, as modern educators have far outstripped the Jesuits in the art of making a deep impression at first, and in the consecutive arrangement of ideas of scientific principles, they are able to attain the same end with much less physical fatigue to the pupils, and much less weariness of spirit, than would be caused by carrying the mechanical part of the revisal to the height done by the Jesuits. They are, therefore, free to devote more attention to the third and most important end in teaching history—that is, the use of it as a means of cultivating the judgment.

(To be continued.)

Publications Received.

Cassell and Co., Limited—
Handbook of the New Code. By J. F. Moss.

Gill (G.) and Son—
The Theory and Practice of Double Entry Book-keeping. By A. Sarll.

Heywood (John)—
Proceedings of the Conference on Education under Healthy Conditions.
Fifty Examination Papers in Dictation and Grammar.
Sketches from Church History. By Mrs. Toogood.

Isbister (Wm.) Limited—
Object Lessons and How to Give Them. By G. Ricks, B.Sc.

Johnston (A.)—
Illustrations of the Manufacture of Iron:—
No. 1. The Smelting Furnace.
No. 2. Cast and Wrought Iron.
Do. Flax and Linen. Nos. 1 and 2.
The History of a Lump of Gold. By A. Watt.

Johnston (W. and A. K.)—
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The Cornhill Magazine. June.

* 'Essays on Educational Reformers,' by Rev. R. H. Quick.

BLACKBERRYING.

Music by T. CRAMPTON.

Cheerfully.
mf
1st TREBLE.
2nd TREBLE.
BASS.
1. Close to the hedg - es where black - ber - ries grow Two lit - tle maid - ens to
2. Gai - ly they chat - ter, the wee maid - ens sweet— Wild rose and dai - sy be -
KEY C. mf Cheerfully.
ga - ther them go; Black eyes and blue eyes are bent to the ground, Search - ing each
- neath their small feet; Brown curls and gold - en are al - most en - twined When the two
G. t.
nook where a ber - ry is found: Lit - tle brown fin - gers, all stained to the tips—
maid - ens one ber - ry must find: Un - der the sun - ny skies, laugh as you go
f. C.
Sweet - er than ber - ries the soft, ro - sy lips.
O - ver the fields where the black - ber - ries grow!
Symph. p
Symph. p

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Lectures on Shakspere's 'Tempest.'

BY H. MARMADUKE HEWITT, M.A., LL.M.,

Late Assistant-Examiner in Classics in the University of London.

NO. IV.—AS FAR AS THE END OF THE SECOND ACT.

(The figures in brackets refer to the pages of the Clarendon Press Edition.)

WE recommence at the point where Ariel re-enters in order to frustrate the action of the conspirators. There is a little difficulty in regard to the words *to keep them living*. This reading has, however, been adopted in the Clarendon Press Edition. The Editor seems to suggest as the explanation, a sort of confusion in the mind of the speaker. Surely after he has used the words: 'My master foresees the danger that *you* are in,' we should have expected the text to read, 'And sends me forth to keep *thee* (or you) living.' Besides the alteration of *them* into *thee*, other critics have proposed to alter *project dies* to *projects die*, and even to *projects dies*, retaining in the last instance the common grammatical error of the singular verb coupled with the plural noun. It is difficult to say which view is the best. Here, as elsewhere, we find ourselves inquiring

'Who shall decide when doctors disagree?'

Some very unusual words occur among the nouns. *Urchin-shows* (31) appears to mean 'appearances of hob-goblins.' The word *urchins* has occurred earlier in the play in one of Prospero's speeches to Caliban. *Bombard* or *bumbard* is a vessel to hold liquor. It may be well to remember that some uphold the reading *a full bumbard* instead of *a foul bombard*. In the play of King Henry IV. (First Part) we find the expression, 'That swoln parcel of dropsies, that huge bumbard of sack.' *Poor-John* is a kind of fish, probably salted hake. A *doit* is a very small piece of coin. A *gaberdine* is probably the coarse frock or outer garment of a peasant. A *swabber* is a man who sweeps a ship's deck with a swab or mop. Does the reader notice that *savages* is sometimes spelt *salvages*? This mode of spelling gives a clue to the derivation, which is from the Latin *silvaticus* from *silva*=a wood. A savage is thus a man who runs wild in the woods. A *mooncalf* is an imperfectly-formed child—an abortion, which was supposed to owe its deformity to the influence of the moon. Popular opinion has at all times assumed a connection between the moon and certain bodily and mental afflictions, and, to a certain extent, this is borne out by science. When Caliban speaks of *crabs* (35), he means crab-apples. The *pig-nuts*, or earth-nuts, are probably known to a good many schoolboys. They will find the botanical name of the plant in the notes to the Clarendon Press Edition. The *marmoset* is a species of monkey. The *young scamels from the rock* are either limpets or rock birds. Some critics prefer to read *sea-mells*, and some *staniels*. Sea-mells are the same as sea-mews, and staniels are kestrel hawks. One of the most absurd variations is *stallions*, which appears in many of the oldest editions. We shall never know with certainty what Shakspere wrote here. *Firing* (36), of course, denotes material for making a fire. Many other concrete words in English have this abstract termination.

The verb *mow* (31)='to make a grimace,' is often spelled *moe*. The same word often appears as a noun-substantive. In *mount their pricks* (ib.) it is easy to see that *mount* has a transitive force. The meaning, therefore, is 'to set up.' In the assertion, *this monster would make a man* (32), the words *make a man* have the meaning of 'make a man's fortune.' Compare the expression, 'a made man,' which denotes a man whose fortune is established. The verb *suffer* in the words *an islander that hath lately suffered*, has the meaning of 'to be killed.' We are told to compare the words of the Creed: 'Suffered (*i.e.*, was put to death) under Pontius Pilate.' *To shroud* (32)

evidently means 'to take shelter.' *To give ground* (32) is only another expression for 'to give way,' or 'to yield.' In all probability the phrase is derived from the language of the prize-ring. To *breathe at nostrils* is the same as 'to be alive.' On page 33, *recover* is used in the sense of 'restore to life.' In *I will help his ague* (ib.) we should now write *cure* instead of *help*. The verb *inherit* is used absolutely, *i.e.*, without any governed noun, in *we will inherit here*, which means much the same as 'we will take possession.'

We will make a special list of the adverbs and adverbial expressions which occur in this portion of the play. *Sure* occurs twice (30) with the meaning of 'surely.' '*That's verily*' seems to mean 'that's true,' some editors propose to read '*that's verity*.' *By inch-meal* (31) is noticeable from the fact that the word *by* is redundant. It might have been written *inch-meal*, like *piece-meal* and *limb-meal*. The derivation is given in the Clarendon Press notes. With the words *after the wisest* (33) we may perhaps understand *fashion*. When Stephano says, 'I was the man i 'the moon *when time was*,' he means 'once upon a time.' Perhaps we may consider *when time was* a transposition of *time was when*.

When Stephano, speaking to Caliban, uses the expression *Amen* (33), all he means is 'stop drinking.' This is obvious from an examination of the context. Some passages are scarcely intelligible by the aid of the text alone. When Stephano says (33), '*Here is that which will give language to you, cat*, he is thinking of an old proverb which says, 'Good liquor will make a cat speak.' Perhaps the student has been a little puzzled by the words, *I have no long spoon*' (33). There is a reference to an old proverb to the effect that a man must have a long spoon to eat with the devil. When Caliban asks Stephano, 'Hast thou not dropped from heaven?' he is only asking the same question as was asked of Columbus and his companions by the newly-discovered Indians of the island of St. Salvador. It must be remembered that in Shakspere's time the discovery of America was a comparatively recent event, and that the popular mind was much interested in the accounts of the American Indians. The Bermuda islands had not long been discovered when Shakspere wrote, and were then so little known that the populace may have half believed that they were inhabited by monsters.

Coming now to the grammatical peculiarities which occur in these pages, we notice (30) the archaic expression *mine ear*. In modern English the possessive pronoun that precedes a noun is always *my*, *mine* being used disjunctively, that is to say, when no noun is expressed. Thus we say, 'This is *my* book,' and 'This book is *mine*.' The past tense of *shake* is now *shook*, but Shakspere writes I shaked you (30). He writes also *swum* for *swam* as the preterite of *swim* (34). In *all wound with adders* (31), the word *wound* does not signify 'wounded,' but 'enwrapped' or wound round with. The student will notice that '*a spirit of his*' implies that there are more spirits than one under the direction of the same person. Otherwise we should write, '*his spirit*.' We have already met with *his* for *its*. There was nothing unusual at the time it was written in the language 'a bumbard that would shed *his* liquor.' In point of fact, *its* is comparatively a modern word. *Put tricks upon 's* (32) is an abbreviation of *put tricks upon us*. We have long ceased to write, *If thou beest* (33) for 'if thou art,' and '*These be fine things*' (34) for 'These are fine things.' It seems hardly necessary to mention that the words '*When's God's asleep*' (35) are a contraction of 'When his God is asleep.' Perhaps we may explain ''*Ban*, '*ban*, *Cacaliban*' by the assumption that Caliban had passed into the inarticulating stage of intoxication by too frequent attention to the contents of Stephano's bottle. It may, however, have been thus written for the purpose of being sung. There is an old song of Sir Philip Sydney's which goes thus, 'Da, da, da—Daridan.'

A word or two may be necessary with regard to the expression *my barefoot way* (31). In this and similar expressions there is a transference of the epithet from that which is its proper substantive—in other words, it is the man that is barefoot, and not the road he travels. The student should be on the look-out for similar expressions. *A holiday fool* (32), of course means 'a fool on a holiday,' just as a holiday task is one that is done (or supposed to be done) during the holiday period.

Apropos of the expression *a herd of lions*, I may draw the student's attention to the very large number of 'nouns of multitude' which exist in the English language. Much confusion and some amusement would be caused by the use of a different noun of multitude from that which custom has rendered appropriate. It would be a good exercise to write the appropriate collective expression opposite each noun in the following list, commencing with 'a flock of sheep.' Take in this way the words *sheep*, *ships*, *girls*, *thieves*, *angels*, *porpoises*, *buffaloes*, *persons*, *partridges*, *ruffians*, *oxen*, *engineers*, *robbers*, *locusts*, and any others which may suggest themselves afterwards.

Among the passages that will be better understood by being paraphrased are *keep a care* (31), for which we should now write 'have a care,' and *securing your repose* (ib.), for which we should write 'guarding your repose.' *Why are you drawn?* means, 'Why are you standing there with your sword drawn?' *Come on your ways* (33), means much the same as 'come along.'

When Stephano says '*my stomach is not constant*' (34), he means 'I feel qualmish,' or 'I am inclined to be sick.' The student will remember the passage where *an undergoing stomach* stands for an 'enduring courage' (8). *I will furnish it anon with new contents*, probably refers, not to the book, but to the bottle, to the contents of which Caliban has taken pretty kindly.

One passage appears to be of the ironical order. Stephano says, '*If I can recover him* (the monster Caliban) *and keep him tame, I will not take too much for him*.' This seems to mean, 'I shall not know how to make a charge for seeing him, of course not,' or, in other words: 'I shall get at much for showing him as I possibly can.' Here, as elsewhere in Shakspere's plays, the wit is not of a very high order. Fortunately, for himself, Shakspere's reputation is not based upon his witticisms.

Apropos of Caliban, and the fondness of the English people for exhibitions, we may mention that a number of Indians were brought over to England by Sir Martin Frobisher. Their appearance, of course, excited considerable interest.

Certain lines from Shakspere have so taken hold of the public mind as to have passed into 'household

words.' What book or newspaper can we take up in which we are not liable to find an allusion to 'an ancient and fish-like smell,' or the assertion that 'misery acquaints a man with strange bed-fellows.' Only the student can give the context of these passages, and tell us, for instance, that these observations were made by Trinculo when he crept under Caliban's garment in order to protect himself from the storm.

When Stephano says, as he does twice, '*here's my comfort*,' he means that he finds comfort in the liquor which he has found, and which frequently finds its way to his lips.

The student who is preparing himself to answer every possible question may endeavour, if he likes, to set down the expressions which Shakspere uses as the equivalent of 'a present for any emperor that ever lived' (31), 'it will probably cure him of his fit' (ib.), 'I am almost inclined to give him a drubbing' (35), and any others. If he can get a fellow-student to assist him in this little exercise, he will find that the passages thus talked over have impressed themselves on his mind very clearly, and they will readily occur to his memory during the ordeal of examination. Higher reward than this, it is perhaps, now-a-days, a little difficult to suggest.

(To be continued.)

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Science Notes.

GAS STOVES.—The abatement of smoke in London is most desirable. Everybody has been of that opinion for a long time. There seems, however, to be a decided movement now, in London at least, in favour of using gas for cooking and heating, while it is being less and less employed for purposes of lighting. There can be no longer any doubt that the excellent gas-cooking stoves are cleaner, more economical, and more easily worked than the kitcheners and open ranges previously in vogue. This difference in cost is very considerable indeed. Another recommendation to busy people is the rapidity with which water can be boiled and meals prepared. This, too, is effected without any soot, and without dust in the house, and without pouring clouds of smoke into the air outside. The London gas companies have wisely determined to let stoves out on hire at barely remunerative rates. Country gas companies should follow their example. There are few questions of more pressing importance than the warming and ventilation of our houses and the cooking of our food. We hail with delight any improvement in either of them. So far as warming a bedroom or sitting-room is concerned, nothing can be more satisfactory than the action of the new gas-stoves for which the gold medal was last year awarded at the International Exhibition. The fire can be lighted at any time by night or day, and in a minute there is a red-hot radiating surface equal to a fire which might have taken half an hour to burn up. It gives no trouble, and makes no dirt. It is certainly as cheap, since it can be put out when it is done with, and re-lighted as soon as it is wanted. Then as to warm water for baths. For a small outlay a gas apparatus can be fitted up, giving a gallon of water at 100° F. per minute. Hence a warm bath is possible at a nominal cost, even when there is no fire in the kitchen, or when, as is often the case, the bath is not supplied with a hot-water pipe. After a considerable experience, we are satisfied that gas answers admirably for cooking purposes. It is economical. In London, where gas is cheap and coals are dear, this, to many people, is a consideration. It is more cleanly. The temperature is quite under control. The oven can be made as hot or as cool as is required. The saucepans are heated independently of the oven, and it is not necessary to spoil one operation in performing another. The kitchen can be kept cool, since the heat is not wasted by radiation into the room. These are great advantages; they are an earnest of what science may do to mitigate the troubles that seem to loom in the future, when our coal supplies, which we have hitherto so extravagantly wasted, begin to fail us. But hardly anything is an unmixed good. So long as the balance of advantage is large, we must be content. When gas is burnt in a room the products of combustion should always be got rid of. Whether they smell or not, they are equally injurious. If the utensils are bright outside there will be scarcely any smell. Perhaps it is as well if there is a little whenever the spent gases are in the room. Their offensiveness is a warning.

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FALL IN PRICES.—The remarkable and serious fall in prices has lately given rise to much discussion. Wool, copper, tin, sugar, and cotton can be bought at about half the price they fetched in 1873. Wheat has fallen from 55s. to 32s., and iron from 127s. to 42s. Figures like these have bewildered the merchants, and in many cases ruined them. The general public have by no means reaped their share of the gain. The middle-men have had an exceptionally profitable time of it. With flour at 32s. per sack we are still paying in London 6d. for the 4lb. loaf. What can be the cause of this unprecedented fall in prices? Is it temporary, or is it likely to become permanent? What answers can the masters of finance and statistics give us? There is a growing conviction that over-production is not a sufficient explanation, nor, indeed, the true one. A relative scarcity of gold would be competent to bring about the effects which we observe, and there is little difficulty in establishing the fact that too little gold is now being produced for the world's needs. Gold is used partly for the manufacture of jewellery and partly as a medium of exchange. As a medium of exchange it is as much a tool as a spade. If, therefore, more exchange has to be done by means of gold, it is certain that unless more gold can be found, every ounce of it must do more exchange work than it did before; in other words, the value of gold is increased, which is the same as saying that prices fall. Now, within the last twenty years, it is estimated that 200 millions have been absorbed in coinage, chiefly for Germany and Italy. Unless more gold is produced annually than is the case at present there is not much chance of a great rise in prices. The effects of all this may be very serious. In the end, no doubt, everybody will be just as well off. But in the meantime there may be many struggles and much suffering. It will be wise for us all to remember that a sovereign ought to purchase more than it did. We must see that we get more useful things for it. It will be easy for masters to reduce wages, but not so easy for men to make the smaller sum go as far as the larger one did.

CAUSES OF COLLIERY EXPLOSIONS.—Herr Hiet and Herr Margraf have recently given an account of some very important experiments in regard to the effects of coal-dust in mines. We are all aware how, by laying a train of gunpowder, we can cause a flame to travel a considerable distance. It appears that fine coal-dust acts in much the same way. Hence, if powder is used for blasting in a part of the mine which is free from explosive gases the flame may be conveyed by dust particles just as by a train of gunpowder to another part of the mine where dangerous gases exist and thereby cause a dreadful explosion.

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STUDENTS of botany will hail with delight the 'Course of Practical Instruction on Botany,' by F. O. Bower. The book has been promised some time, and is therefore doubly welcome. Let the earnest student get it at once, and work as he is directed. His progress will not be rapid, but it will be sure. And the mental training will only be equalled by the delight which the study of nature at first hand never fails to bring.

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THOSE who have an interest in organic chemistry will thank us for calling their attention to Professor Remsen's 'Introduction to the Study of the Compounds of Carbon.' They will find in its 364 pages more of what it is most desirable to know than in many of twice the size. It is certainly one of the most important and valuable books on the subject. It has the advantage of being in English.

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Publications Reviewed.

The Woodford French Book. By G. F. H. Sykes, B.A. Relfe Brothers.

'As far as I know,' says Mr. Sykes, B.A., 'no English book for beginners in French contains a methodical set of lessons in French pronunciation.' Their state is the more gracious! To represent by any combination of letters the sounds peculiar to any language is practically impossible, and this Mr. Sykes admits. 'There is nothing corresponding to the nasal sounds in English; *and they must be learnt from the teacher.*' After such an admission, it is difficult to understand why Mr. Sykes should have written his book. The grammatical portion is somewhat confused, and the chief object was, apparently, the French pronunciation, which, after all, 'must be learnt from the teacher.' To understand how worse than useless, how misleading Mr. Sykes's rules of pronunciation might be, we need look at only two or three examples. Thus, the French *e* he represents by the English *eh*, which *might* represent the accented, but *not* the unaccented *e*, and the student who should read the examples *me*, *le*, etc., *meh*, *leh*, etc., would make a very serious mistake. Again, the accented *é* is translated into the English *ay*. Now had Mr. Sykes added, 'with its sound in such words as may, day, etc.,' all would have been well. But 'ay' alone would be pronounced 'i.' Has Mr. Sykes ever heard a Hamlet say, 'Ay,' (as in *day*,) 'marry is't'?

And what would French people think of the unhappy child who should, at Mr. Sykes' suggestion, pronounce am, en, em, as *om*; im, ain, aim, ein, as *in*; om as *on*, and un as *un*? Mr. Sykes's grammatical rules are rather better than his rules on pronunciation. But there is want of method, and a young child would be like to get confused, while for more advanced pupils the book is too childish.

We have in Brachet and others excellent grammarians. To learn a language practically, *i.e.*, to speak it, we need a teacher. Mr. Sykes' book is not one that can replace either our more thorough grammars or competent teachers.

Mistaken Views on the Education of Girls. By Johanna Lohse. Christchurch, N.Z.: Whitcombe and Tombs.

Miss Lohse tells us that she has had twenty years' experience in teaching on the Continent, in England, and the Colonies. Hence, much that she says is of real interest. Her book is a very earnest appeal to the 'upper' classes to extend to girls some of those educational advantages thought necessary for boys, advantages which Miss Lohse seems to think the 'lower' classes are already giving them. Miss Lohse begins by saying that she is not going to speak of 'women's rights,' and that she 'believes in women's duties.' But Miss Lohse should know that there ought to be no duties without rights, and no rights without duties, and as a matter of fact she does very warmly ask for the 'right' of every girl to have her highest mental faculties developed. All who know something of 'private schools' will be able to endorse what Miss Lohse says; will be able to speak as she does of their (for the most part) utter inefficiency, or worse, and many a teacher will echo Miss Lohse's complaints as to the terrible difficulty of dealing with young girls whose parents look upon all learning as a kind of misfortune, and who think education can be sacrificed with impunity to the most frivolous amusements. That the 'over-pressure' brought to bear upon the children of the rich is due to the first want of training is unquestionable: that so many girls are turned adrift upon the world, with no means of earning a livelihood, is due to the old idea that any education 'will do' for a woman, is equally certain. Against both these evils Miss Lohse protests vigorously. Her book would, however, have gained in value and in interest if she had given less quotations and more facts as to her own experience. Most educated people have read the authors she quotes, and to come upon quotation after quotation, or one hackneyed phrase after another, is terribly wearisome. To find from four to six more or less long quotations on a page is nothing exceptional.

While heartily agreeing with Miss Lohse in many of her statements and aims and suggestions, we cannot but take exception to others. Thus she asks: 'How can we expect the young to grow up and "live mightily" if religious instruction be excluded from our public schools and high schools?' With many others interested in the question of education we believe that the school—where of necessity there are children of all denominations—is *not* the best place for religious instruction: that this should not be part of the daily 'lessons,' but a special lesson to be taught in the *home* by the mother. Experience has also proved to us that Miss Lohse is mistaken in supposing that a young child cannot learn several languages without confusing them. Older people truly mix up languages till they become 'a strange pot pourri.' But not so children. We have known little ones who spoke two, or even three, languages with perfect purity.

In conclusion we must protest against Miss Lohse' constant and irritating use of the word 'nice,' which occurs we know not how often in her pages, and remind her that 'averse *to*' is not grammar. Still, with all faults, this book is not uninteresting, and is certainly superior to many we have seen on the same subject.

Analysis of the First Book of Samuel. With Notes, Critical, Historical, and Geographical. By Lewis Hughes, B.A. London: John Heywood.

How far middle-class education has been affected by the Oxford and Cambridge Local Examinations we shall not fully see until those who have been educated under its influence are the strength of the nation. No time could have been happier for its introduction than when

elementary education, under eminent inspectors, was making such mighty strides.

Thanks to these practical inspections of uninspected schools, middle-class education has even almost more advanced than that of the lower orders. A comparison of the grammar or commercial school of the present day with what it was thirty, or even twenty, years ago would show greater results than a like comparison between the modern Board-school of to-day and the village school of 1840 or 1850. By no means the least advantage gained is the supply of first-class, well-printed, cheap manuals, whose very existence was made necessary by these separate examinations.

In examining these manuals, what we have to look to is method of arrangement. Criticism we don't expect; but what we do expect is perspicuity, to enable the student to learn what he is to supposed to know in the shortest and most permanent way. The book before us is not Mr. Hughes' first effort, having already helped in preparing other books of the Bible. The usual marking which a student would adopt to draw his attention to what he would recollect is here cleverly done for him by the use of thicker type. At the end of every chapter there is a set of questions, and at the end of the volume a map and tables of events, places, etc., with one paper covering the whole book. With such a book, well worked, one is not astonished that the examiners always expect a fair number of boys and girls to get full marks, as some, at least always do.

Systematic Tests in Arithmetic. Standards II. to VI. By J. F. Timpany. London: John Marshall and Co.

These are five little books, each containing seventy-two tests of four sums each. The work of the year is divided into three terms, each term being again divided into three parts. With each book a syllabus of the work is given, so that a teacher who adopts a different arrangement of his work will find tests suitable to his method.

The books are well printed in a bold type, are published at a low price, and provide systematic tests for the whole year. The questions are varied in style and difficulty; and as the last term's work consists mainly of inspectors' questions, practice in preparing for the annual examination is provided. The answers are correct, and the method of testing easy to remember. When known, the books are sure to command a ready sale.

The 'Dot' Parsing and Grammar Notes. Manchester: John Heywood, Deansgate.

This is a halfpenny card, of inconvenient size, printed on both sides, and containing, or meant to contain, the principal facts, etymological and syntactical, of English grammar.

It is said to be designed for pupil-teachers and upper standards. As such it ought to have been full, and accurate, and modern. Instead of that, there are many omissions, and several things are included which we consider obsolete; many subdivisions are treated as separate divisions, and generally the whole wants addition and revision. The article is given as a separate part of speech, instead of being classed as an adjective.

There are said to be five kinds of nouns, and yet gerunds are put down as a sixth class. We think three classes are sufficient.

Under the head of gender, the pupils are allowed to suppose that there are four genders, instead of two. 'Nominative of address' is never mentioned under the head of case. The word 'this' is classified in two ways, without stated reason; and the sub-classes *indefinite* and *distributive* are put as separate classes of adjectives. Active verbs are spoken of as under the head of case, and are nowhere mentioned under the division of verbs. The different parts of the verb 'to be' are in several places spoken of as 'Verbs—to be'; so also we have 'Verbs—to have.' Under the head of auxiliaries, only those of the future tense and potential mood are mentioned; and the words *let*, *dare*, *do*, and *did* are incorrectly placed among the latter, even if it be considered necessary to have a potential mood at all. The participles are placed as a separate mood of verbs, and prepositions are said to relate only to nouns or pronouns.

Like objections could be taken to other parts of the 'Notes'; and we cannot recommend the card as in any sense a complete synopsis of what is required from pupil-teachers and elder scholars in the subject of which it treats.

Philip's Geographical Readers. Standards I. to VI. London: George Philip and Son, 31 and 32, Fleet Street, E.C.

We have gone very carefully through the whole of these volumes, and can accord them our highest commendation. Whether it be number and beauty of illustrations, legibility and accuracy of diagrams and maps, style and quality of literary matter, or interesting and varied method of treatment, which the teacher looks for in a set of Readers, or all of these advantages combined, he will find them in perfection in the series under review.

As Readers they leave nothing to be desired. We could have wished, for teaching purposes, however, that each chapter in the latter books had been followed by a short summary, as in the first three volumes—practical teachers knowing the necessity for definite memory-work after even the most interesting lesson. Such summaries would have added materially to the value for examination purposes of these excellent books.

Shakespeare's King Henry V. Abridged to 673 lines. London and Edinburgh: W. and R. Chambers.

Opinions may differ as to the value of abridged editions of Shakespeare's plays. Where one is desired, teachers may be assured that they will find this abridgment well done, and with copious notes which will materially help in understanding the portion of the text selected.

Chambers's Reprints of English Classics. (*a*) Tintern Abbey, Ode to Duty, Ode to Immortality, and Happy Warrior. By William Wordsworth. (*b*) Campbell's Select Poems. London and Edinburgh: W. and R. Chambers.

These reprints are annotated, printed, and edited as carefully as the others of the same series which we have from time to time noticed in these columns.

Readings from 'Robinson Crusoe.' London: Blackie and Son, 56, Old Bailey.

We prefer 'Robinson Crusoe' unabridged; but the selection of passages here presented to us has been carefully made. The volume is well illustrated, and has a glossary of the most difficult words. Like the other volumes in the same series, it is clearly printed, suitably bound, and may be cordially recommended as a reading-book for upper classes.

Higher Reading Book for Schools and Colleges. By Charlotte M. Yonge. London: National Society's Depository.

A book of 428 pages, made up of nineteen extracts from a dozen authors, with a short introduction to each selection, is published under the above title. The selection has been made with care and judgment, and gives considerable variety, the number of pieces being limited by the necessity for securing completeness for each subject, and more sustained interest than is possible in shorter extracts. The book gives a very fair idea of the style of modern writers, and may be used with advantage in the schools for which it has been compiled.

Ivy Chimneys. By Edith Cornforth. Wesleyan Methodist Sunday-school Union.

'The object of this story,' we are told in the short prefatory note, 'is to strengthen the longing—sometimes, perhaps, vague and hardly recognised—which the writer believes to exist in many hearts, to help the childish waifs of our great cities'; and so we trust it will, and, in spite of its crudities, cannot but think it may.

We do not remember ever to have seen the name of the authoress attached to any other book, nor does she on the title-page acknowledge anything as an earlier effort of literature. Under these circumstances it would, perhaps, be wrong to expect too much, and cruel to be hypercritical, for every page of the book teems with the sympathetic heart of the writer.

Though published by a sectarian Sunday-school Union, there is nothing to imply any narrow-minded idea that good work must be done on any particular lines and in any special connection. The heroine of the book, who, by a caprice on the part of her father, is prevented from seeing the country during her childhood, devotes her time and fortune to the reclaiming small waifs of both sexes. She at last marries a 'parson,' who has been the means of changing the life and aims of a naughty boy, who figures in the story; but whether the said 'parson' belongs to the Church of England or to the Wesleyan Connexion is not hinted at.

It is a pity that the authoress did not bring into contact the two sets of characters before she tells the early history of the principal waif reclaimed by the heroine. She could easily, and with more interest, have gathered up the child's early history after the reader had connected them together. This child, the preface tells us, is no creation of the authoress's brain, nor, we presume, its companionship with a white bull-dog, whose kennel he shares until driven thence by a hard-hearted watchman.

We heartily, however, congratulate the authoress on this, if it is, as we suspect, her first effort to do good under the guise of fiction, and urge her to take courage and go on. The publishers have done all that could be done to make the little volume presentable and attractive.

Tales for Composition (Standard V.), with Hints on how to Write and how to Teach them. Edited by Alphonzo Gardiner. John Heywood.

Though the readers of the PRACTICAL TEACHER who are engaged in elementary teaching will know at once the object of this unpretending little book of ninety-eight pages, others may wonder at the meaning of the title. To such it may be told that the Government Code now requires pupils of certain standards to be able to reproduce on their slates a story which has been read, or better, told to them by their teacher. These stories, with many teachers, are generally taken from the different reading-books, which, by constant hearing or reading, some of the children almost know by heart; hence their efforts at reproduction are, for the most part, a verbatim copy of some of the sentences, often so badly strung together as to form no sense whatever. This book is published evidently to prevent this, which it certainly ought thoroughly to do.

First, we have a clearly-written introduction, which contains twelve invaluable rules to all who would study composition, however, simple or otherwise; concluding with one strangely neglected by only too many, viz., 'When the work is finished, look it over carefully, and correct, when correction is absolutely necessary.'

These stories are supposed to be reproduced in different lengths, from nine up to thirty lines, the number being printed at the head of each. On the left-hand side of every paragraph there is a note of its contents. As a specimen of the stories told, we noticed that of Meissonier and his gardener, and the roe of the red herring, which was made current not so very long ago, though we are bound to add that it is slightly altered from what we read in one of the daily papers; but the author acknowledges in his preface that he has ventured to 'abridge, adapt, and arrange.'

As the book is not intended to be placed in the hands of children, the following does not much matter; but it would be a pity to teach young children such a new definition of analysis as we find in the following sentence taken from the preface:—'The special feature of the collection is analysis and synthesis—the analysis being the scaffolding by means of which the children are to build up their composition exercise, the use of which is explained in the introduction.'

Philip's Illustrated Standard Poetry Book. For Reading and Recitation. Geo. Philip and Son.

It seems as if every educational publisher must have in his catalogue every imaginable school-book that any teacher or class may require; hence the multiplication of manuals without end. We do not suppose that any school committee pin their faith to one publisher, and order nothing but his editions. It would be very unwise of them if they did, for no one who knows anything of books can doubt but what one firm gets possession of an admirable text-book on one subject, and another on another.

We feel convinced that had not Messrs. Philip published, with considerable success, other school-books, they would never have issued the book under review. The manual, it is true, is beautifully printed; the illustrations are good, and it may be, probably is, very cheap; but there are far better collections, containing more poems, and much more sensibly arranged. There is no preface, and nothing to explain why the work is divided into four parts, nor why some of the poems should be numbered 1(*a*), 1(*b*), etc. This is a great mistake, because in giving out, say, a lesson to be learnt at home, instead of a single number, which would answer every purpose, the teacher would have to burden the child's mind with three facts—as Part II., 3(*b*). We know of an arithmetic being discontinued in a school on account of this. Again, though a footnote tells us that Henry Russell wrote 'Man the Lifeboat,' and an American, T. B. Aldrich, a poem called 'The Face against the Pane,' we are supposed to know who wrote 'Far, far upon the Sea,' and 'The Inchcape Bell.' There are a few short notes, explanatory of words, or referring to the same idea as expressed by another poet. Some of the earlier numbers are new to us, but whether original or not we cannot say. Two or three times we noticed little four-line hymns or extracts from larger compositions, which are not even numbered at all.

Longman's Modern Series—Shakespeare's Coriolanus. By John W. Allen. Longmans.

A flyleaf tells us the object of this series is to supply a larger-type edition, to give introductions and notes containing all that a young student wants to know, to furnish illustrations of an instructive character, to provide examination papers, and, lastly, to do all this at a low price, using good paper, and sending out each number in strong, durable binding. On the whole, we are bound to add that this particular volume very fairly fulfils the above promise.

With regard to the illustrations, excepting the picture of Rome, which forms the frontispiece, and the interior of Aufidius' house, and one or two others, we fail, we confess, to see wherein the instruction lies—*e.g.*, the death of Coriolanus, though a spirited drawing enough, must be a matter of imagination, and may be as far from the truth as possible.

The introduction is well done, containing a short account of Shakespeare himself, a very short paragraph as to his writings, longer ones on his grammar and versification, taken, for the most part, from Dr. Abbott's wonderful work on the subject, and the story of the play

concluding with a short essay on the character of Coriolanus himself.

The notes are at the end of the volume, a better arrangement for a book to be used in class; and these are followed by some five pages of the derivations of many words used in the play.

The examination papers (thirty in number), containing four questions each, are well arranged, and fairly exhaustive. These, again, are followed by an appendix on prefixes, affixes, and derivatives, which is interspersed with valuable exercises on word-building. As a class-book, we heartily recommend it, and think it one of the best books, for the purpose intended, which we have seen.

Scripture Biography and its Teachings. By Joseph Hassell, A.K.C. London: Blackie and Son.

Mr. Hassell tells us in his preface that these biographies were, for the most part, prepared by him, when he was an officer at the Home and Colonial Training College, for a Sunday afternoon Bible-class held for the advantage of the students in residence.

There are five groups of characters dealt with, viz., (1) patriarchs and judges, (2) kings and prophets, (3) Christ and His Apostles, (4) St. Paul and his companions, and (5) women of the Bible. In addition to these five groups, there are seven subjects suitable for senior classes, *e.g.*, what the Scriptures reveal respecting God.

To take an example as to how the characters are dealt with:

JOSEPH (increase).

1st Period.—His boyhood, sub-divided into two parts—(1) the cause of his brothers' hatred; (2) his being sold.

2nd Period.—His captivity, sub-divided into three parts, all of which are again divided.

3rd Period.—His governorship in Egypt, which is sub-divided into five parts, each of which is also carefully re-divided.

And, lastly, the 4th Period, which relates his death.

There is nothing, of course, at all original in all this; but still the book would be useful and suggestive to the Sunday-school teacher.

The supplementary lessons, though contained in a much shorter compass, are more valuable in every way.

This volume is, for its size and general get-up, wonderfully cheap, and ought to obtain a large sale.

The French Handbook: Open Competition Handbooks.

This book, the author tells us in the preface, is intended to supplement, not to supersede, existing works, and assumes the student to have, at least, the ordinary school-boy's knowledge of French. The handbook consists of two parts. In the first, which is headed 'French and English Syntax compared,' an attempt is made to deal only with such points as present difficulty to the English pupil. The second part is made up of passages for translation from English into French, and from French into English. The selections are of considerable difficulty and length. No help is given in the way of notes or vocabulary. The pupil is, no doubt, expected to have the assistance of a competent teacher.

It is by the first part that the author's success must be measured. And there cannot be two opinions as to the brevity with which the rules are stated. The arrangement and printing are excellent. One is tempted to ask, Could not half the matter have been omitted? The reply would be that the book has been written for a special object, and its merits must be judged of accordingly. If the student, therefore, now and then finds that he is learning what he is not likely to prove of use to him hereafter, he must not complain. So long as examiners ask questions on subjects of fourth-rate importance, so long will there be a vigorous effort to meet their requirements by all who have a great interest in satisfying their demands. The office of examiner is a far higher one than has yet been realised, and in the present system of education in this country the influence which examiners exert on the methods and aims of instruction is very great indeed. Will they see that their influence is for good?

Handbook of the New Code, 1885. By J. F. Moss.

This excellent manual of 140 pages is well arranged and excellently printed. It contains the Code and the instructions to the inspectors, as a matter of course. It contains, however, very much interesting and valuable matter besides. Wherever the articles of the Code seem to need elucidation, notes are added which give additional information. There is also a full index to the subjects treated of in the Code and in the circulars to inspectors. This handbook is, doubtless, well known by this time, and duly appreciated by those for whom it is intended. The former editions were all good, and there are no changes in this which are not improvements.

Thome, Structural and Physiological Botany (Bennett): Text-Books of Science. Longmans and Co.

This is not a new book. It is a new edition, the fifth that has been issued in eight years. No further evidence of its usefulness need be asked for. It was originally meant to be a high-class text-book on Botany, and at the same time of a size and price to bring it within the reach of all students of Natural Science. And such it certainly is. The editor believes it is well suited to the requirements of the preliminary scientific, the intermediate, and the final degree of B.Sc. He points out at the same time, with refreshing candour, that a mere book knowledge of this, as of any other natural science, is absolutely useless. The minute structure of plants, as well as their more obvious forms, must be studied with the aid of the microscope. Without this constant reference to the facts of plant life, the study loses its fascination and its value. Fortunately, examiners are quite able to detect at once whether students have been studying the facts at first hand. Let them refuse to accept anything but the genuine article, and at the same time never forget that one can read twenty statements in the time it takes to verify one. If pupils are to be encouraged to see for themselves instead of taking things on trust, the amount of ground to be covered must be proportionately reduced. In many cases the syllabus seems to have been drawn up on one supposition, and the examination paper on another. We have no doubt the fifth edition will prove as popular as the preceding one. Neither editor nor publisher can wish much more.

Proceedings of the Conference on Education under Healthy Conditions. Manchester, 1885.

The conference held at Manchester in April, 1885, was a very remarkable one, following so closely after the International Conference at the Health Exhibition in 1884. It is a sign of the intellectual life and public spirit of the University City. Educationists may take courage. This new interest in all that relates to mental and physical development has not arisen a day too soon. Englishmen are slow to move; but when they are really alive to their defects they work with indomitable energy to remove them. After all, the foreigner may not be so much ahead of us as we sometimes think.

The proceedings of the Manchester Conference are here collected in a neat volume of less than 400 pages, and sold at a very moderate price. Teachers and others interested in school work will find in the thoughtful papers and discussions much that is useful and suggestive. It is as unnecessary as it is impossible to enumerate the topics treated of in the papers before us. Our readers will get the book and study it for themselves. They will not need reminding of the exceptional interest a writer of a paper takes in his subject, nor of the impracticability of carrying out

the suggestions of them all. We venture to say, however, that there is not a single paper that may not be read with advantage.

One cannot help asking, after all, What then shall we teach, and with what end in view? We seem to want a judicial summing-up. There is not time to do all that is asked of us, nor the half of it. This has been gradually decided for the elementary teacher by the education department. It would none the less be instructive to have not only the decisions of the most competent judges but their reasons for them. There are, undoubtedly, certain prime requisites which must be taught, as being the foundation of all that is learned afterwards. There may be other subjects which must receive attention if England is to retain her supremacy as a manufacturing country. Others again claim attention in their relation to the moral and physical development of the nation. Considerations like these will not only determine the curriculum of the scholars, but to a large extent that of the teachers too, a fact just now in danger of being lost sight of. Specialists must not imagine that their arguments have not been weighed because a statesman cannot accede to their wishes.

There is one question of pressing importance at the present time: how can we get rid of the monstrous system of weights and measures, which wastes at least a year of a boy's school-life so far as arithmetic is concerned? One need not scruple at calling it a scandal and disgrace to British intelligence. Hardly less discreditable is the system of English spelling. Boys are kept grinding at this miserable exercise till they acquire the useless superiority of being better spellers than half the greatest men in the country. Is there no room for reform or relaxation here? Who will urge this upon the authorities? And who will have the courage to give relief?

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Books of the Month.

The book of the month that is like to be more read and more discussed than any other is Mr. Jeaffreson's 'Real Shelley.' It will, at all events, be a *succès de scandale*, and probably this is all that Mr. Jeaffreson bargained for. Those whose misfortune it has been to read this gentleman's 'Real Lord Byron' will know what to expect. Those who do not know what this production was, and who may really imagine that Mr. Jeaffreson will throw a fresh light on the character of Shelley, should, however, be warned. A prize-fighter might as well attempt an essay on Ariel as Mr. Jeaffreson write about Shelley.

Professor Dowden has already shown in the *Academy* that Mr. Jeaffreson is thoroughly unreliable as to the simplest and most trivial facts; and since it is chiefly on the trivial errors of other Shelleyan writers that Mr. Jeaffreson harps, it was necessary to show how far from accurate he is himself. Mr. Jeaffreson, who seems to discredit one Shelleyan because he states that Shelley remained somewhere 'nearly a month,' while, in point of fact, he only—so Mr. Jeaffreson states—was there a '*little over three weeks*' (where is the difference?), must not complain, as he does, that Professor Dowden has touched upon side-issues only. To prove Mr. Jeaffreson wrong here is to prove him wrong altogether. For our own part, it seems utterly superfluous to discuss Mr. Jeaffreson at all; even if his facts were correct—which they are not—the *spirit* of his book would still be absolutely false. We may tell nothing but the truth of a man and yet calumniate him, and Mr. Jeaffreson's book, even if he had not told many untruths about Shelley, would still be a ridiculous libel. For our own part, we hope Shelleyans will *not* answer Mr. Jeaffreson. He is not worth it, and Shelley might say to him, in the beautiful words of Brutus, that calumnies touch him not:

> 'For I am armed so strong in honesty
> That they pass by me as the idle wind
> Which I respect not.'

The life of Mary Wollstonecraft Godwin, wife of William Godwin and mother of Mary Shelley, just issued by Mr. Ingram in his 'Eminent Women Series,' comes especially *à propos* at the present moment. Mr. Jeaffreson, in his very unreal Shelley, has devoted a great number of pages to the vilification of Mary Wollstonecraft Godwin, and this carefully-compiled biography will be of use in correcting many of Mr. Jeaffreson's mistakes and misstatements. Even those who cannot in any way sympathise either with Mrs. Godwin's views or approve her acts, will, after reading Elizabeth Pennell's 'Life,' feel that she was a great, true-hearted, noble woman—erring often perhaps, but always honest, and even then, when we most condemn her, still worthy our esteem. Altogether, Miss Pennell's is one of the best volumes in Mr. Ingram's series.

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In 'Old Times,' Mr. John Ashton has given us a most amusing and instructive volume on the social life of England at the end of the eighteenth century. This life he sets forth for us chiefly by means of contemporary illustrations and satirical sketches. Allowing for the slight exaggerations of caricature, we still have here a very faithful picture of the many strange and curious fashions of the times. But we also can learn something of more interest than the mere changes in dress of modish ladies and gentlemen. There is much information of historical value in this book—as, for example, with regard to 'impressment' (on one evening in 1790 no less than 2,100 persons were 'pressed' in London alone), the state of the army and navy, the abuse of patronage, the condition of Art, etc., etc.

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Books of travel, just now, are occupying themselves chiefly with Africa. There is the new edition of Commander Cameron's 'Across Africa,' with new and original matter, and Stanley's book on the 'Congo,' with many works by less known authors. Most of these writers look upon Africa as a happy hunting-ground for commercial operations by white men, and it is assumed that the natives 'like it.' It is, we know, a theory with fox-hunters that foxes enjoy the sport. Perhaps the Africans enjoy the European conquest of their land in the same way.

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Those who are fond of what is called 'Society Gossip' will enjoy Count Vasili's 'The World of London,' though the book is, truth to say, rather a disappointment. It has, in the English at all events, the greatest fault such a book can have—it is dull.

***

'A Coquette's Conquest,' by Basil, is by no means an uninteresting book. It is too long: the terrible three-volume system has once again spoilt what might have been really good work. Even as it is, the novel is better worth reading than nine out of every ten. The character of the heroine, Lucy Lisle, the 'coquette,' is admirably drawn. She is not the ridiculous and irritating monster one is so used to in 'modern works of fiction.' She is very unpleasant, but decidedly human. She lies and cheats and deceives every one; she is utterly selfish, and yet has a certain superficial good-nature that is not without charm; she is completely *un*moral, *i.e.*, devoid of any moral sense; but the character is real, life-like. A clever contrast to this interesting but disagreeable young person is provided in her sister, Mary Lisle—who is good and true, yet not too perfect for 'human nature's daily food.' Very pleasant people are the impulsive, warm-heated Irish couple who receive poor Lucy when she has come on her mad escapade to London; and altogether delightful are the bullying father of the two girls and his Yorkshire neighbours. The meeting of the 'Parochial Council' is as good as Charlotte Brontë's curate-scenes in 'Shirley' and some of George Eliot's sketches.

In 'Stories Revived,' Mr. Henry James has reprinted, in volume form, a number of short stories and sketches—many new to English readers—that range over a period of some twenty years. Mr. James has, we think, been guilty of one great error. He has, he tells us, largely re-written the stories here collected. The interest of such volumes would be to compare the method of the Henry James of twenty years ago and of to-day; to contrast the earlier with the latest work; to note the development of the author; to watch the growth of certain peculiarities and mannerisms. And in re-touching and re-writing portions of the tale Mr. James has destroyed their intrinsic value. Either they should have been re-written altogether—and then we should have had the work of the author of 'The Portrait of a Lady'—or he should have left the early work alone—and we might have seen what this author was years ago. As it is, we get, in many cases, an unsatisfactory patchwork. Nevertheless, with all faults, Mr. Henry James is unquestionably one of the most interesting writers of the day, and everything he does is worth careful study. It is pleasant to note that, in our opinion at least, not one of his short sketches is better, or even so good, as the excellent little one, 'The Path of Duty,' that appeared only a few months ago for the first time. This is pleasing evidence that Mr. James has not 'written himself out'—a fear we confess to having felt when comparing 'The Portrait of a Lady' with, say, 'Roderick Hudson.'

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Mr. Anstey (Guthrie) has not, it seems to us, produced anything better, or indeed so good, as his 'Tinted Venus.' There is exquisite humour in his treatment of the old legend that a ring placed on the statue of a Venus recalls that goddess to life. The hero of Mr. Anstey's 'romance' is a hairdresser; and Mr. Anstey has drawn him with the hand of a master. Anything more delightful than his visit to Rosherwich Gardens, and his conversations with the goddess, we do not remember to have read for a long time. Nor is the story wholly fantastic. Tweddle (the hairdresser), Bella, Tillie, Miss Tweddle—all these are real studies from life. Tweddle's letter is a *chef d'œuvre*. There is a touch of genius in his assurance to Lillie that 'never did he swerve not what could be termed a swerve for an instant'; in 'this dilemmer which is now sounding its dread 'orns at my very door,' and that he has not 'the hart to spell.' And, as in all true humour there is some pathos. We advise every one to read this 'romance'—infinitely funnier than either 'Vice Versâ' or 'The Black Poodle.'

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'Mrs. Keith's Crime,' although published anonymously, is well known to be the work of Mrs. Clifford, the widow of one of the most sympathetic of modern scientists, Professor W. K. Clifford. It is a most remarkable work, and one that we are not astonished to find is creating a great sensation. The story is as powerful as it is original, full of tragic strength and humorous observation. In a few sentences, with a few touches, Mrs. Clifford makes us know the characters she draws—and know they are true. The book is almost painful in its sadness. Its only fault is, perhaps, that it is a little too long, that there are repetitions that somewhat weaken the effect of the whole. What the 'crime' is, it would not be fair to say. We may only observe that the 'crime' becomes an act of heroic courage. Only a woman could have drawn Mrs. Keith—only a woman who had loved and lost much could have painted for us 'this passionate woman's heart.' We are sure no one who reads this book will ever forget the mother and her little ones, Jack and Mollie. Mrs. Clifford, if she fulfils the promise of this work, has a great career before her.

—o—

How I Teach Domestic Economy.

BY MRS. WIGLEY.

Author of 'Marshfield Maidens,' 'Our Home Work,' 'Workers at Home,' 'Royal Series Domestic Economy,' 'Cookery and Home Comforts,' 'The Merryweathers,' 'Thoughts,' etc.

CHAPTER IV.

SUITABLE DRESS.

BUT after such efforts as these to give to our girls a just and honourable appreciation of the work which naturally falls to our hands, we have not by any means done with the subject.

We must endeavour still 'to exalt our calling' in their estimation, and continual occasions for doing this will not be wanting. If we ourselves once become converts—heart and soul converts—to Milton's doctrine—

> 'For nothing lovelier can be found in woman
> Than to study household good;'

we shall find opportunities more than enough for the spread of our own convictions.

The reading lessons will often give us choice extracts or examples on the subject, and the incidents of daily life will afford plenty of chances of 'improving the occasion.'

And then by degrees we shall begin to reap the reward for our skill and tact. Gradually *the tone* respecting such things will undergo a change. We shall have honest, earnest, energetic purpose instead of false shame and lack-a-daisicalness, and sound common sense will take the place of foolish sentimentality.

And you must not forget this change of feeling respecting the work is the very backbone of all future success. We shall want to invest that work with all that will make it pleasant and beautiful, I know, but we must also fearlessly undermine *the prejudice* by all allowable means.

We must not be content with pretty aprons and caps, and a little acquirement of practical skill. We must endeavour to establish it as a first principle that woman's work—her lawful and noble work—is home work well done. By all means improve the condition of 'the working dress' as to convenience, suitability, and sweet cleanliness; have nothing to do with the 'it-won't-show-the-dirt' garment, especially in food preparation. But don't stop here. Never lose sight of the great aim—happy, healthy, prosperous homes for the future.

I had once something to do with a class of girls—about thirty—who formed a domestic economy class. When these girls entered the lecture-room, they were a picture indeed. They wore most of them their 'best frock,' and they had been supplied with holland pinafore aprons, 'trimmed cardinal,' and white muslin caps, of the French shape, with a cardinal bow in front. The fresh girl faces looked quite bewitching, just as all girl faces must look that are fresh and clean and bright when engaged about any work. But I soon found these girls had not learned their first lesson. Their aprons and caps were more to them than any amount of practical information. There was a general fussiness respecting their appearance, a frequent 'putting each other to rights,' which indicated *a dressed-up feeling*, the very feeling which, alas!

had all their lives been connected with *doing nothing*. And before they left I heard one coaxing another to clean her saucepan for her, 'because you don't mind messy jobs, and I do.'

Dear friends, that woman has done something in her day and generation who has instilled this truth into only a *few* minds:—*A woman should never be dressed beyond usefulness, and yet she should always be dressed to dainty neatness, appropriateness, freshness, and prettiness.*

I do not know anything more humbling to us as women than the sight which meets the eyes of any one who wanders among the homes of our girls at cleaning-up time on a Saturday. Shall we meet one woman in twelve doing her necessary work and looking as a woman should look? Would any stranger, looking at the unkempt, dusty, ill-used, yet beautiful hair, the besmeared faces, the draggled, soiled, rent, and often pinned together dress, be ready to agree with him who said, 'the beauty of the English women is not surpassed by any in the world'?

Poor working sisters, drudged and driven! They must purchase some fashionable flimsy thing at first because it is fashionable, 'like what ladies wear;' and when the first gloss is gone, it comes in 'for afternoons,' and all too soon it is voted 'only fit for a hack,' and as 'any old thing will do for work,' we get the present-day result as to appearance.

Let us glorify our home duties and have a pride in the badge which marks our lawful employment. How desirable it would be to establish a *national costume* for English women—a costume at once useful and convenient, as well as tasteful and becoming; as graceful and suitable for work as for play; worn alike by princess and peasant, difference of rank being marked only by costliness of material.

Don't accuse me of discussing Utopian impossibilities. Don't you realize that if you remove this stumbling-block, you remove a mountain? Don't you know that it is shame at 'the figure she is' which goes to make more than fifty per cent. of a girl's dislike to be seen at her household work? which makes her dread to begin it, and leads her to scamp it over quickly when she does begin? If she knew that she was in no way disfigured by her habiliments, she would lose these feelings in great measure, or rather she would never have them to lose.

So, in our talks and lessons with our girls, let us try to give them right ideas about working dress. Let them understand that the best part of our lives we must expect to have to be in 'working trim.' If we mean to be 'a thing of beauty' in God's fair world, we must always be neat and nice and fresh, and have stamped on our whole appearance freshness and sweet homeliness, which makes the greatest charm of home.

In my next paper let me bring before your notice various matters which it is well our girls should be made acquainted with, respecting *Woman's tools*.

(*To be continued.*)

—o—

University of London.

MATRICULATION EXAMINATION:

June, 1885.

English Language.

[N.B.—*Not more than* TEN *Questions are to be attempted; and in the ten must be included Nos.* 1, 14, *and* 15.]

Examiners { HENRY CRAIK, Esq., LL.D., M.A. / Prof. JOHN W. HALES, M.A.

1. Write out and punctuate the passage read by the Examiner.

2. What are the two main sources from which the English Vocabulary is derived? From which of them comes our Grammar? Illustrate your answers by examples.

3. Distinguish between the terms 'cognate' and 'derived' as applied to words. Mention some words cognate with *bear* (the verb), and some derived from it.

4. What do you know of the origin of these words:—College; University; Degree; Examine; Student; Scholar; Pass; Fail; List; Matriculation?

5. What is meant by a 'letter'? Give some account of the letter C and its uses? What various sounds are represented in English by the letter U?

6. Define the terms 'inflection,' 'analysis,' 'synthetic,' 'interjection': 'strong' and 'weak' as applied to verbs; 'abstract' and 'concrete' as applied to nouns; 'simple' and 'complex' as applied to sentences.

7. Make a list of the most common noun-formatives, with instances of their use and explanations of their force or forces.

8. Discuss the forms: Brethren; seamstress; indices; fisherman; cherry; kine; swine; cherubim; riches; uttermost.

9. What exactly is meant by a 'Pronoun'? What by a 'Relative Pronoun'? Mention any differences in usage between *who* and *that*.

10. To which conjugation do the following verbs severally belong:—see, saw, say, sow, sew, sue, set, sit, seethe, sell? Write down the past tense and the past participle of each one, noticing any irregularities.

11. What three origins has our 'substantive verb'? Explain *worth* in 'woe *worth* the day.' Mention some usages in which 'am' as an auxiliary has been ousted by 'have.'

12. Write some short sentences to show the various meanings of the prepositions *at, with, of, from, against*. Explain 'He did his duty *by* him,' '*under* these circumstances,' 'ten *to* one, it is not so,' 'add ten *to* one,' 'keep up *for* my sake.'

13. Parse *after* in each of the following sentences:—'His *after* life shows him to greater advantage'; '*after* him then and bring him back'; '*after* he came all went wrong'; 'you go first and I will come *after*'; *after* that I will say no more';—and *out* in '*out*, brief candle'; 'he was quite *out* of it'; '*out* upon it'; 'he was beaten *out* and *out*'; 'he proved an *out* and *out* deceiver.'

14. Point out and correct anything wrong or dubious in the following sentences:—

(*a*) I had hoped never to have seen the statues again.
(*b*) Luckily the monks had recently given away a couple of dogs, which were returned to them, or the breed would have been lost.
(*c*) It was the most amiable, although the least dignified, of all the party squabbles by which it had been preceded.
(*d*) Having perceived the weakness of his poems, they now re-appear to us under new titles.
(*e*) Neither you nor I am right.
(*f*) I am one of those who cannot describe what I feel.
(*g*) Whom they were, I really cannot specify.
(*h*) Whom do you say I am?
(*i*) His is a poem, one of the completest works that exists in any language.
(*j*) He was shot at by a secretary under notice to quit, with whom he was finding fault—very fortunately without effect.

15. Analyse:

(*a*) I am monarch of all I survey.
(*b*) 'Tis love that makes the world go round.
(*c*) His business was to beat the enemy, and he knew he could not beat the enemy unless he could get the best officers it was possible to get.

Arithmetic and Algebra.

Examiners { Prof. A. G. GREENHILL, M.A. / Prof. BENJAMIN WILLIAMSON, M.A., F.R.S.

1. A dealer buys coffee at £5 15s. per cwt. and chicory at

£2 12s. 6d. per cwt. and mixes them in the proportion of four parts of chicory to seven of coffee. Find at what price per cwt. he should sell the mixture so as to gain 20 per cent. on his outlay.

2. Express

$$\frac{1}{2}+\frac{1}{2.4}+\frac{1}{2.4.6}+\frac{1}{2.4.6.8}+\frac{1}{2.4.6.8.10}+\frac{1}{2.4.6.8.10.12}$$

as a decimal, to ten places.

3. Find, to five places of decimals, the value of $\frac{\sqrt{3}-\sqrt{5}}{\sqrt{5}+\sqrt{3}}$

4. Find the value of:

(1) $(x+y+z)^2+(x+y-z)^2+(x+z-y)^2+(y+z-x)^2$;

(2) $\frac{x+y}{(z-x)(z-y)}+\frac{x+z}{(y-x)(y-z)}+\frac{y+z}{(x-y)(x-z)}$.

5. Find a fraction such that if its numerator and denominator be each increased by 36, its value shall be doubled: and if 9 times its numerator be added to 8 times its denominator, the sum shall be 3 times the product of the numerator and denominator.

6. Solve the system of simultaneous equations:

$$\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=62;$$
$$\frac{x}{3}+\frac{y}{4}+\frac{z}{5}=47;$$
$$\frac{x}{4}+\frac{y}{5}+\frac{z}{6}=38.$$

7. Show how to find the sum of n terms of a geometrical progression whose first and second terms are given: and find the sum of 12 terms of the geometrical progression whose first and second terms are 2 and 3, respectively.

8. A trader setting out with a capital of £1,500 makes a clear profit over all expenditure of £80 in the first year; of £110 in the second; of £140 in the third; and so on of an additional £30 in each additional year: find his entire capital at the end of thirty years.

9. Find the co-efficient of x^4 in the product of the expressions $(1-x+x^2-x^3+x^4)^2$ and $1-2x^2+4x^4$.

10. If 310 men can dig a trench of 11 feet broad, 6 feet deep, and 155 yards long in half an hour, find what length of trench, 10 feet broad and 7 feet deep, 2,000 men can dig in 6 hours.

Geometry.

1. The angles at the base of an isosceles triangle are equal to each other; and if the equal sides are produced, the angles on the other side of the base are equal.

Prove this, if you so prefer, by the method of superposition.

2. Prove that the three interior angles of every triangle are equal to two right angles; and that all the interior angles of any rectilineal figure together with four right angles are equal to twice as many right angles as the figure has sides.

3. If the square described upon one of the sides of a triangle is equal to the squares described upon the other two sides, the angle contained by these two sides is a right angle.

4. Show, by placing four equal rectangles round a square so as to form another square, that four times the rectangle contained by a whole line and one of its parts together with the square on the other part is equal to the square on the line which is made up of the whole line and that part.

5. Describe a square which shall be equal to a given rectilineal figure.

6. The angle of a segment and the angle in the segment are together equal to two right angles.

7. Determine the condition in order that a circle can be inscribed in a quadrilateral.

8. Prove that in a right-angled triangle the line joining the right angle to the middle point of the hypotenuse is half the hypotenuse.

9. Describe a regular hexagon about a given circle.

10. A point moves so that the sum of the squares on its distances from the sides of a square is twice the area of the square. Determine the path of the point.

Latin.

Examiners { Dr. SCHMITZ, F.R.S.E.
Prof. A. S. WILKINS, LL.D., M.A.

I. CÆSAR: *Gallic War*, V., VI.

Translate into English.

A.

His rebus gestis, Labieno in continente cum tribus legionibus et equitum milibus duobus relicto, ut portus tueretur et rem frumentariam provideret, quaeque in Gallia gererentur cognosceret consiliumque pro tempore et pro re caperet, ipse cum quinque legionibus et pari numero equitum, quem in continenti reliquerat, ad solis occasum naves solvit et leni Africo provectus media circiter nocte vento intermisso cursum non tenuit et longius delatus aestu orta luce sub sinistra Britanniam relictam conspexit. Tum rursus aestus commutationem secutus remis contendit, ut eam partem insulae caperet, qua optimum esse egressum superiore aestate cognoverat. Qua in re admodum fuit militum virtus laudanda, qui vectoriis gravibusque navigiis non intermisso remigandi labore longarum navium cursum adaequarunt.

B.

Hac in utramque partem disputatione habita, quum a Cotta primisque ordinibus acriter resisteretur, *Vincite*, inquit, *si ita vultis*, Sabinus, et id clariore voce, ut magna pars militum exaudiret; *neque is sum*, inquit, *qui gravissime ex vobis mortis periculo terrear: hi sapient; si gravius quid acciderit, abs te rationem reposcent, qui, si per te liceat, perendino die cum proximis hibernis coniuncti communem cum reliquis belli casum sustineant, non rejecti et relegati longe ab ceteris aut ferro aut fame intereant.* Consurgitur ex consilio; comprehendunt utrumque et orant, ne sua dissensione et pertinacia rem in summum periculum deducant: facilem esse rem, seu maneant, seu proficiscantur, si modo unum omnes sentiant ac probent; contra in dissensione nullam se salutem perspicere.

C.

Viri, quantas pecunias ab uxoribus dotis nomine acceperunt, tantas ex suis bonis aestimatione facta cum dotibus communicant. Hujus omnis pecuniae conjunctim ratio habetur fructusque servantur: uter eorum vita superarit, ad eum pars utriusque cum fructibus superiorum temporum pervenit. Viri in uxores, sicuti in liberos vitae necisque habent potestatem; et quum paterfamiliae illustriore loco natus decessit, ejus propinqui conveniunt et, de morte si res in suspicionem venit, de uxoribus in servilem modum quaestionem habent et, si compertum est, igni atque omnibus tormentis excruciatas interficiunt. Funera sunt pro cultu Gallorum magnifica et sumptuosa; omniaque, quae vivis cordi fuisse arbitrantur, in ignem inferunt, etiam animalia, ac paulo supra hanc memoriam servi et clientes, quos ab iis dilectos esse constabat, justis funeribus confectis una cremabantur.

II. HISTORY AND GEOGRAPHY.

1. Show by a rough map what was the course which Cæsar took in crossing to Britain the second time. How far did he advance into the country?

2. Describe the position of the following:—Cassi, Remi, Eburones, Carnutes, Treveri, Cherusci, Trinobantes, Meldi. To what tribes did Lutetia, Agendicum, Noviodunum, Durocortorum belong?

3. What were the officers and the divisions of a Roman legion? What other soldiers had Cæsar under his command? How were these divided and commanded?

4. 'Quoniam Pompeius ipse ad urbem cum imperio reipublicae causa remaneret': explain the circumstances here referred to.

5. Describe the position of Cæsar in Gaul at the time at which Book V. begins. What were his powers? Whence were they derived? What part of the country was subject to his authority; and in what way had it been subjected?

III. PASSAGES FOR TRANSLATION FROM BOOKS NOT PRESCRIBED.

(*a*) Plus ira quam misericordia in causa eorum valebat; quia non ut hostibus modo, sed tanquam indomitae et insociabili genti succensebant. Per aliquot dies cum certatum esset, postremo neque dari neque negari pacem placuit. Duae condiciones eis latae sunt: vel senatui liberum arbitrium de se permitterent; vel mille talentum darent, eosdemque amicos et inimicos haberent. Exprimere cupientibus quarum rerum in se arbitrium senatui permitterent, nihil certi responsum est.

(*b*) Denique opus nostrae culpetur ut undique curae,
officium nemo, qui reprehendat, erit.
Ut desint vires, tamen est laudanda voluntas:
hac ego contentos auguror esse deos.
Haec facit, ut veniat pauper quoque gratus ad aras,
et placeat caeso non minus agna bove

Latin Grammar and Composition.

1. Decline in the singular and plural *mus edax*, *idem jus*, *melius poema*; and in the singular *vis quaedam*, *ista palus*, *una pirus*.

2. Give the genitive singular and plural, and the gender, of *fons, pons, vas, mos, apex, ordo, linter, tuber, socer, tribus.*

3. Give the first person singular of the perfect indicative, the future participle and the present infinitive, of *parco, jubeo, aufero, lego, pungo, pango, tundo, fundo, rodo, quaero.*

4. Give the second person singular of all the active tenses of *prosum, malo, vincio, rapio, gero.*

5. Show by examples the constructions used with *impero, posco, opus, interest, circumdo, parco, pudet, juvat, egeo, faveo.*

6 Parse fully *oneris, petiti, sceleris, clădo, sedulo, necesse, arcesse, nequisse, moriare, morare.*

7. Distinguish between *cānis* and *canis, mālis* and *malis, ĕdit* and *edit, lăbor* and *labor, dicet* and *dicet.*

8. Turn the following passage into *oratio recta*: Errare eos dicunt, si quicquam ab his praesidii sperent qui suis rebus diffidant; sese tamen hoc esse in Ciceronem populumque Romanum animo, ut nihil nisi hiberna recusent, atque hanc inveterascere consuetudinem nolint: licere illis incolumibus per se ex hibernis discedere, et, quascumque in partes velint, sine metu proficisci.

And the following into *oratio obliqua* after a verb in a past tense: Vincite, si ita vultis, neque is sum qui gravissime ex vobis mortis periculo terrear; hi sapient; si gravius quid acciderit, abs te rationem reposcent.

9. Translation into Latin.

[N.B.—*Particular importance is attached to the correct rendering of these sentences.*]

(*a*) The boy promised to use the money wisely.
(*b*) No one knows when the enemy will attack the city.
(*c*) He says that you have bought a house for more than you can pay for it.
(*d*) I believe that the Gauls will soon send an envoy to pray for peace.
(*e*) This gallant soldier marched from Athens to Thebes in two days to relieve the besieged garrison.
(*f*) After he had ruled the country with great success for twenty-five years, he met a glorious death in battle against the invaders.

Greek.

I. XENOPHON: *Hellenica* II.

Translate into English:

A.

Οἱ δ' Ἀθηναῖοι πολιορκούμενοι κατὰ γῆν καὶ κατὰ θάλατταν ἠπόρουν τί χρὴ ποιεῖν, οὔτε νεῶν οὔτε συμμάχων αὐτοῖς ὄντων οὔτε σίτου· ἐνόμιζον δ' οὐδεμίαν εἶναι σωτηρίαν εἰ μὴ παθεῖν ἃ οὐ τιμωρούμενοι ἐποίησαν, ἀλλὰ διὰ τὴν ὕβριν ἠδίκουν ἀνθρώπους μικροπολίτας, οὐδ' ἐπὶ μιᾷ αἰτίᾳ ἑτέρᾳ ἢ ὅτι ἐκείνοις συνεμάχουν. διὰ ταῦτα τοὺς ἀτίμους ἐπιτίμους ποιήσαντες ἑκατέρους, καὶ ἀποθνησκόντων ἐν τῇ πόλει λιμῷ πολλῶν, οὐ διελέγοντο περὶ διαλλαγῆς. ἐπεὶ δὲ παντελῶς ἤδη ὁ σῖτος ἐπελελοίπει, ἔπεμψαν πρέσβεις παρὰ Ἄγιν, βουλόμενοι ξύμμαχοι εἶναι Λακεδαιμονίοις ἔχοντες τὰ τείχη καὶ τὸν Πειραιᾶ, καὶ ἐπὶ τούτοις ξυνθήκας ποιεῖσθαι.

B.

Οἱ δὲ τριάκοντα ἠρέθησαν μὲν, ἐπεὶ τάχιστα τὰ μακρὰ τείχη καὶ τὰ περὶ τὸν Πειραιᾶ καθηρέθη· αἱρεθέντες δὲ ἐφ' ᾧτε ξυγγράψαι νόμους, καθ' οὕστινας πολιτεύσουτο, τούτους μὲν οὐ ἐμελλον ξυγγράφειν τε καὶ ἀποδεικνύναι, βουλὴν δὲ καὶ τὰς ἄλλας ἀρχὰς κατέστησαν ὡς ἐδόκει αὐτοῖς. ἔπειτα πρῶτον μὲν οὐκ πάντες ἦδεσαν ἐν τῇ δημοκρατίᾳ ἀπὸ συκοφαντίας ζῶντας καὶ τοῖς καλοῖς καὶ ἀγαθοῖς βαρεῖς ὄντας, συλλαμβάνοντες ὑπῆγον θανάτου· καὶ ἥ τε βουλὴ ἡδέως αὐτῶν κατεψηφίζετο. οἵ τε ἄλλοι, ὅσοι ξυνήδεσαν ἑαυτοῖς μὴ ὄντες τοιοῦτοι, οὐδὲν ἧχθοντο. ἐπεὶ δέ ἤρξαντο βουλεύσθαι, ὅπως ἂν ἐξείη αὐτοῖς τῇ πόλει χρῆσθαι ὅπως βούλοιντο, ἐκ τούτου πρῶτον μὲν πέμψαντες εἰς Λακεδαίμονα Αἰσχίνην τε καὶ Ἀριστοτέλην ἔπεισαν Λύσανδρον φρουροὺς σφίσι ξυμπρᾶξαι ἐλθεῖν, ἕως δὴ ταύς πονηροὺς ἐκποδὼν ποιησάμενοι καταστήσαιντο τὴν πολιτείαν· θρέψειν δὲ αὐτοὶ ὑπισχνοῦντο.

C.

Ὁ μὲν τοιαῦτα ἔλεγεν· οἱ δὲ λοιποὶ ἄρχοντες καὶ διὰ τὸ τοιαῦτα προσακούειν τοὺς μεθ' ἑαυτῶν ἀπήγαγον εἰς τὸ ἄστυ. τῇ δ' ὑστεραίᾳ οἱ μὲν τριάκοντα παυ δὴ ταπεινοὶ καὶ ἔρημοι ξυνεκάθηντο ἐν τῷ ξυνεδρίῳ· τῶν δὲ τρισχιλίων ὅπου ἕκαστοι τεταγμένοι ἦσαν, πανταχοῦ διεφέροντο πρὸς ἀλλήλους. ὅσοι μὲν γὰρ ἐπεποιήκεσάν τι βιαιότερον καὶ ἐφοβοῦντο, ἐντόνως ἔλεγον, ὡς οὐ χρὴ καθυφίεσθαι τοῖς ἐν Πειραιεῖ· ὅσοι δὲ ἐπίστευον μηδὲν ἠδικηκέναι, αὐτοί τε ἀνελογίζοντο καὶ τοὺς ἄλλους ἐδίδασκον ὡς οὐδὲν δέοιντο τούτων τῶν κακῶν, καὶ τοῖς τριάκοντα οὐκ ἔφασαν χρῆναι πείθεσθαι, οὐδ' ἐπιτρέπειν ἀπολλύναι τὴν πόλιν. καὶ τὸ τελευταῖον ἐψηφίσαντο ἐκείνους μὲν καταπαῦσαι, ἄλλους δὲ ἑλέσθαι. καὶ εἵλοντο δέκα, ἵνα ἀπὸ φυλῆς.

II. GRAMMAR.

1. Parse the following verbs, mentioning the first person singular of the present tense:—ἠπόρουν, παθεῖν, ἐπελελοίπει, ἠρέθησαν, κατέστησαν, ἤδεσαν, ἀπήγαγον, τεταγμένος.

2. Decline throughout: ἀνὴρ εὐσεβής, καλλίων γυνή, μέλαινα θρίξ.

(To be continued.)

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